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EDITORIAL NOTES.

The Second Step to the Calorific Standard.

ANOTHER step has been taken in the application of calorific power as the standard of the quality of gas which will form an important precedent, though, as in the case of the Gaslight and Coke Company, the step has been accomplished by agreement. But it is of far weightier importance to the gas industry than the change that was effected by the Gaslight Company's Bill of 1909. In that case—there was no help for it—a calorific power test carrying a penalty had to be accepted in addition to the retention of the illuminating power one also with a penalty attached. This condition was very objectionable to, and was reluctantly accepted by, the Governor (Mr. Corbet Woodall) and his colleagues. In the instance now before us, the conditions surrounding the calorific power test are somewhat less onerous, and, what is more, although the local authorities may test if they so will for illuminating power, their findings in this particular will not involve any penalty. Penalty will only attach to default in respect of calorific power; and therefore calorific power is statutorily established for the first time in this country in an important and extensive area as the primary quality for gas. This advance in change from the standard of quality that has become effete to a standard of quality that represents present-day gas usage is to be found in the Amalgamation Bill (as amended) of the Wandsworth and Putney, Mitcham and Wimbledon, and Epsom and Ewell Gas Companies. In the settlement of the terms of this new calorific power clause, there has been a tough fight behind the scenes; and the endeavour of Mr. H. E. Jones, the Chairman of the Wandsworth Company, and of those associated with him has been to realize a standard and conditions that will not prove irksome—either to themselves, or, as a precedent, to the gas industry generally. They have got as low as they possibly could in the matter of practical terms suitable to conditions such as their own in respect of gas manufacture; but what they have finally settled upon is not exactly what they desired. It is, however, the best that could be secured under the circumstances; and there is not much of which to complain. But, in succeeding cases, time, experience, and local conditions must be used in the process of putting the terms into a more shapely and plain-sailing form.

However, the great point is that this is the pioneer Bill in the abrogation of illuminating power as the standard of quality, infraction of which incurs penalty; and the next important point is that the conditions attaching to the new calorific power standard are easier than the cumbrous ones that the powers-that-be external to the Gaslight Company insisted should be applied in their case. But the Gaslight standard and conditions we have always looked upon as being merely tentative, as there is a triennial appeal provided to the Board of Trade for modification—the current year being the last one of the first triennial period. The Wandsworth standard is placed at 136 calories gross—that is to say, about 544 B.Th.U. gross; but there is to be no liability to penalty so long as the gas is not of less calorific power than 122 calories (about 488 B.Th.U.) gross. We are glad that the Wandsworth Company have succeeded in getting rid of a net valuation, as prescribed in the case of the Gaslight Company's clauses. Most competent students and practitioners of calorimetry the world over, excepting perhaps France, are in favour of gross valuation. But there is one other change which it would have been desirable for the promoters of the Bill to have brought about—that is, to have had the standard rendered in British thermal units instead of calories. We are getting mixed in our industrial terminology. We talk of candles and cubic feet; and here we get into the hybrid stipulation that the standard quality of the gas shall be so many "calories per cubic foot." However, it will be seen that the standard is more in accord with the conditions governing gas supply in the Metropolis and the suburbs than is that of the Gaslight and Coke Company, which prescribes 125 calories net (500 B.Th.U. net), with penalties attaching to deficiency below 112½ calories net (450 B.Th.U. net).

The conditions attaching to the testing for calorific power in the new clauses are equitable. Only one test is to be made at any one testing-place in a single day; but if it is found that the calorific power is below 115 calories, a second test is to be made at an interval of not less than one hour from the time of making the first test—the average of the two tests being deemed the calorific power of the gas for that day. But if on any one day, the calorific power is less than 122 calories to an extent not exceeding 7 calories, the gas examiner is to make tests on the two following days; and the average of the three testings is to be deemed to represent the calorific value of the gas on the one day at the testing-place concerned. This will give protection against any accidental lapse. In the case of the Gaslight and Coke Company, the average of three days' tests is obtained by taking the day before and the day after the day of the deficiency. The penalties, which are progressive in amount according to the extent of the deficiency, will be found in the clauses as reproduced in our "Parliamentary Intelligence." It will also be observed that, as in the case of the Gaslight and Coke Company, application can be made by any of the parties to the agreement, at the end of three years, for a revision of the terms of the standard and testing.

It is unnecessary to labour the importance of this first transition in this country from illuminating power to calorific power as the standard of quality. A beginning has been made; and the precedent in favour of change will, there is no doubt about it, be adopted—if promoters themselves do not see fit to voluntarily make the move—by the advisers of local authorities as an excellent alteration to effect in view of the circumstances of the day. The administrators of gas undertakings who are in future promoting measures in Parliament will therefore be safeguarding themselves by being prepared with information as to the maintainable calorific power under the conditions of their present working, in order that they may be in a position to come to terms, or to advance evidence as to what will be an equitable standard under their circumstances before one is imposed that, in the absence of such evidence, may prove to be oppressive and an impediment to economical working in the interests of consumers and suppliers alike.

Depreciation Allowance for Income-Tax.

BRIEF references have been made in our columns to the fact that there is an excellent prospect of a settlement being effected with the Inland Revenue authorities on that extraordinarily vexed subject of depreciation allowance for income-tax. Although for a few weeks past, the matter has not been heard of, it is not in a dormant state, but is being actively pursued, with a desire on the part both of the authorities and of the representatives of the interests of the section of the gas industry most aggrieved over this matter, to determine a fair and workable basis of depreciation allowance. The representatives of both sides are meeting on common and friendly ground. The negotiations are being conducted by delegates representing a large number of gas companies with, in the aggregate, a considerable amount of capital. Among the delegates, Mr. William Cash, F.C.A., and Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, are taking an active part. With the Companies' delegates are united, on behalf of the Institution of Gas Engineers, the President (Mr. R. G. Shadbolt) and Mr. W. R. Herring. These intimations are sufficient to give the assurance that there will be no definite agreement on anything that is not considered equitable.

Meantime, there is a point that we are asked to particularly emphasize. It will be noticed that, in the paragraph appearing elsewhere which, formally and succinctly, covers what

is being said here, it is stated that "there is every hope that "a satisfactory settlement will be arrived at." The hope is well founded; for the Inland Revenue authorities are meeting the delegates of the gas companies who have taken up this matter in a way that makes manifest a desire on their part for the formulating of a satisfactory base of allowance. This being so, the paragraph continues: "Companies, there- "fore, who have assessments under appeal, are advised to "take steps to get further proceedings adjourned, pending "a final settlement of the negotiations." This advice will not be neglected. We are, however, in a position to go farther than this. It is known that some companies have been, if they are not now being, pressed by local assessors in this matter. While these negotiations are proceeding with the Inland Revenue authorities, gas companies may take it, if they are being subjected to pressure by the local assessors over this point of depreciation allowance, that they can suggest to the latter the exercise of a little patience until a basis is established. If they decline, then a communication to the Inland Revenue authorities in London will no doubt adjust matters until there has been a settlement.

The present negotiations, it will be understood, affect only companies; and, of course, those who are acting have not received any mandate to do so on behalf of the entire gas company undertakings of the kingdom. This is fully recognized. But, on the other hand, the position in respect of capital of the companies represented at the conferences and in the negotiations is a sufficient assurance that the best possible is being, and will be, done. It is hoped that the negotiations will be sufficiently advanced to warrant a general meeting of the representatives of gas companies during Institution week. The action of the representatives of the Council who are working in conjunction with the delegates of the large gas companies concerned would then, without doubt, be cordially ratified. But a meeting to consider the matter depends entirely upon the position of the negotiations with the Somerset House authorities.

Chemical Manufacturers and the Gas Industry.

THE Alkali Manufacturers' Association have during the past week added additional scalps to their girdle; and so further reasons have been adduced as to why the gas industry should pursue very active measures (if success does not attend those already taken) in bringing to the notice of both Houses of Parliament the gross injustice that is being done by placing the industry through piecemeal infliction of restriction—if this is allowed to continue—largely and effectually in the hands of the opulent chemical combination, as well as, by the limiting of markets, the future control of the prices paid for residuals to gas undertakings who are not in the position to work up their own liquid products. The new cases in which restriction has been imposed are the Wandsworth and the York Gas Companies' Bills. The York case was a contested one; but the clause went in despite the protest made by Mr. Honoratus Lloyd, K.C., and Mr. Corbet Woodall and other witnesses. Lord Barnard and his colleagues of the Committee before whom the York Bill came appeared to be guided by what Lord Ritchie had done in the case of the South Suburban Bill rather than by any considerations of equity. What is being done is to alter, without any adequate justification, what has for years been almost general gas law. Some time ago we argued that the words of the model clause "provide, supply, and deal in" residuals gave gas undertakings whose general powers clauses were on the lines of the model one the right to purchase raw materials without the specific mention of the term "purchase;" and Mr. J. D. Fitzgerald, K.C., Counsel for the Alkali Manufacturers' Association, during the York proceedings, agreed that this is so. This raises an important point in connection with the insertion, by the Unopposed Bills Committee, of the restricting clause in unopposed Bills, without the promoters having an opportunity of considering whether or not they are prepared to accept an uncontested revision of the powers that Parliament has bestowed. It is considered in some quarters that—we say this with all respect—powerful as the Private Bill authorities are, they are acting in excess of their powers in, under the circumstances, imposing the objectionable restriction in unopposed measures. It is one of the strangest pieces of legislative procedure of modern times to tie the hands of statutory contributors to, and dealers in, open markets, while leaving free those of non-statutory competitors. This can only have one end, and that not in the public interest. The first move was made on behalf of the gas industry on Thursday afternoon, when the Lord Chairman privately received a deputation from the Council of the Institution of Gas Engineers and the Gas Companies' Protection Association in reference to the matter, and promised to give careful consideration to their representations. If the matter is raised in the House of Commons, it is hoped that all gas undertakings in the United Kingdom will betimes place the position fully and properly before their local parliamentary representatives, so that the matter may be effectually dealt with.

Light and Competition.

THE lecture that Mr. Jacques Abady delivered, in refreshing vein, to the North of England Gas Managers' Association last Saturday is one that will stimulate thought, and give added strength to those of the gas industry immediately engaged in the competitive campaign in the lighting field to-day. It is in interior lighting where real competition is the strongest; and the more our work has taken us into the realms of the electric lighting engineer, the more have we become convinced that the gas industry, in the matter of interior lighting, does not, generally speaking, fully appreciate the strength of its own position, simply because the merits of its means of illumination have not been studied with that thoroughness in their scientific aspects that they deserve. There has been no hesitation on our part to say this before; and in that simple, transparent fact of a scientific neglect, it is our belief, lies much commercial loss to the industry in the lighting field. Mr. Abady treats the matter plainly and wholesomely. He does not deal in recondite questions, nor take us to any of the dizzy heights to which scientific exploration has reached. But he states some clear practical truths that should knit together ambitions and nerve actions. Ascertained facts and principles are stated, which should supply us with the starting-points for renewed commercial activity in the work of interior illumination, as well as starting-places for scientific investigation. We have to remove a leaf from the book of our competitors, and take plenary advantage of our multiple virtues, which extend much beyond the point of cost. The world has to be taught the nature of these advantages; but the gas industry has not in this respect taught the world—except through effort of a very superficial character. That is what the lecturer told the gas industry in courteous terms, the full meaning of which must not be taken by our readers and others at their mere face-value.

To properly appreciate the complete strength of our own indoor illuminant, one must know both the strength and the weaknesses of our competitor. The electrical industry in the matter of lighting has always suffered from a swollen head; and people with swollen heads are prone to grossly exaggerate. In connection with small electric incandescent light units (the only ones with which we are concerned on the present occasion), electricians have claimed too much. The gas industry knows it; but the gas industry has not made sufficient of this weakness and provable excess claim. We were pointing out last week that the inverted gas-lamp gives the gas industry a large advantage in its lower hemispherical light. The metallic filament lamp has not this advantage. Mr. Abady now strengthens the point from his own personal tests. Taking an inverted gas-lamp of the same mean horizontal candle power as a metallic filament lamp, he finds that this mean horizontal candle power is repeated in its lower hemispherical light. This is an important advantage on the side of the inverted gas-lamp—an advantage that cannot be claimed by the metallic filament lamp. Again, our own investigations have proved that the claims, verbal and printed, of 1 watt, or even 1·1 or 1·2 watts, per candle-power-hour with metallic filament lamps, are illusive, and that 1·3 to 1·4 watts are fairer figures to take—that is, taking British standard candles, and not Hefner units. The lecturer, however, has made a more extensive investigation; and he finds that, in the whole range of lamps that he took, and tested at the stated current consumption, only one of them came up to the rated candle power, and that all were in excess of the rated wattage. As a matter of fact, he has ascertained that the variation in wattage with different lamps is from 1·42 watts per candle power to 1·81 watts, with a mean of 1·59 watts. Easy to see is the large difference here between claim and actual result; and what a substantial difference this must make to the lighting bill! On the basis of 1·59 watts, the lecturer gives a very useful table, showing the comparative costs as between metallic filament lamps

and inverted gas-lamps. All along the line, it is seen that metallic filament lamps cost three to four times more than inverted gas-lamps. If the costs of burners and mantles and electric lamps were included in the calculation, further advantage would accrue to gas. A metallic filament lamp, too, gives a better light the first few hours than that yielded after burning 70 to 100 hours. That is another of the disclosures of actual testings.

So much for the claims and actualities in the particular matter of cost and consumption in relation to lighting value. That is the competitive aspect of the subject to which the gas manager naturally turns, and which he is prone to make much of, to the neglect of others that are also of very genuine importance when thrown into the balance against electricity. Mr. Abady refers to certain of the other merits, which are qualitative and hygienic. There is the composition of the light emitted from different sources. Here gas has an advantage which should be made much of in competition. A light is a better one to work by, both in relation to sight and colour judging, that has a good amount of green in it than a light containing more red or violet. In respect of "best "quality," incandescent gas-lamps are in the ascendent over both arc and metallic filament lamps; and thus by them the eye is less tormented than by metallic filament lamps, objects viewed under incandescent gas-lights are brighter than those viewed under metallic filament lamps, and by the former colours may be better judged, though some experimenters say the two types of lamp are about equal in this respect. But the curious thing is that all colour corrective work has been done on electric lamps—thus showing that scientific investigators have satisfied themselves as to which light most needs correction. The same with another defect of the metallic filament lamp, from which the incandescent gas-lamp suffers only in minor degree—that is, the intrinsic brilliancy of the light, which the higher it is the more harmful it is to eyesight. All the work of moderating this evil has been concentrated on the metallic filament lamp. There is no need to ask why. Gas-lamps have a lower intrinsic intensity; and therefore a higher diffusive power. Thus we have in the lamps of the gas industry quite a bevy of advantages that go to make a good hygienic light; and the industry are not making the utmost use of the fact. Against these superiorities, electric light holds the one of superior convenience. Convenience, however, is not of such material importance as the advantages enumerated on the side of incandescent gas lighting.

What of the future? Mr. Abady does not think there is much chance of greatly improving the duty one obtains from a cubic foot of gas; and he believes that the signs of the moment are that electricians stand the better chance of making further advance from the present position. It seems to us that here, in this one connection, the lecturer showed a little weakness in deduction from the premises that are to be found in the lecture itself. The direction in which research electricians are now working is the employment of vapour as the conductor of current. There is yet to be learnt something as to the expense of this to obtain a light that possesses a practical working colour. On the other hand, we find that there is a big scope for advance in gas lighting in the large amount of unabsorbed energy—unabsorbed for lighting—contained in the heat of the gas. Then, realizing that, at low pressures, shop and street lamps have been designed that give a duty of 40 candles per cubic foot of gas, there is hope yet for a further expansion of the duty derivable from the purely domestic burner. Further, we see that the lecturer believes there is room for a great deal of work in the production of burners in which the proportions are so arranged that a cubic foot of gas at 6 inches pressure will give more light than a cubic foot at 2 inches pressure. There is also the production of low-grade gas—not by increasing the percentage of inert constituents, but by attenuating the hydrocarbons, so that "while increasing "in volume, they decrease in intrinsic calorific power, and "cause our finished product to get nearer the point where "we can obtain the heat we require to render our mantles "incandescent by the admixture of just the right amount of "air." Moreover, there is the improvement in the tone and quality and distribution of light by the use of prismatic glass and proper reflectors. Taking all this into consideration, while we do not by any means think that electricity has no latent potentiality in the matter of lighting, we see ample scope for the gas industry to advance to higher places by considerable strides from the elevated position in efficiency that it already enjoys.

An Up-to-Date Dessau Plant.

It was a good engineering constructional paper that Mr. R. Nelson read at the meeting of the North of England Gas Managers' Association on Saturday. It described an installation of carbonizing plant of the latest design on the Dessau system, with auxiliary plant that is as modern as it can possibly be in type, detail, and method of operation. This East Hull installation can claim to represent in this country the very latest views of those who have spent many years in developing the Dessau system: and for this reason, and because it is so complete in ancillary plant, it will hardly be possible to make a comparison between it and the Sunderland Dessau plant, which is on the earlier type, and is not externally equipped in the manner of its East Hull successor. The house in which the Hull plant is located is a good type of modern practice in erecting habitations for vertical retorts—a steel structure in which reinforced concrete and "Hy-rib" sheeting take part and place. The combination makes a neat, clean, light type of building for the purpose. The retorts are set in beds of eighteen, disposed three in a row; and when this is said, it is sufficient for those who have followed vertical retort construction to know that here we have the latest approved Dessau design. A feature of the plant is that the discharging-doors are operated by hydraulic gear; and therefore hydraulic plant constitutes part of the auxiliary equipment. The discharging-doors can also be operated manually.

Steps have been taken to check radiation from the bench by the use of "Thermalite" bricks on parts of the front walls and the whole area of the top of the settings between the mouthpieces. Combined with this provision to conserve heat, it is noticed later that it is only found necessary to clean the fires once in twelve hours. There are two points here contributing to a low fuel account; but it is impossible to make proper comparison of fuel with the best of other English working in this respect for the simple reason that, for two hours towards the end of each twelve-hour charge, gas production is supplemented by gentle steaming, and nevertheless illuminating power is kept above the standard. In these circumstances, there is a 16 per cent. fuel account, which does not, in view of the steaming, appear to be extravagant. It would be of interest to know what the fuel account is without steaming; and likewise what are the production and quality of gas, all other conditions remaining the same, without steaming. The telpher plants for handling the coal and coke, together with the electric generating plant for motive power, all impart to the installation those modern features that make this East Hull works' extension extremely attractive. When we come to consider what is comprised in the figure of £249 8s. per ton (calculating on a carbonizing capacity of 81 tons of coal per day) as capital cost, it cannot by any means be considered a heavy one. The same with the labour charges. Including carbonizers, scurfing and attendance, coal and coke handling, exhausters and boiler men, and foremen, the costs only total to 9·48d. per ton on the present carbonization of 68 tons per day. With twelve-hour charges, men working on two eight-hour shifts suffice. Mr. Nelson is to be congratulated upon his installation, upon having so much of technical interest to communicate in regard to this up-to-date plant, and on his good working results—in regard to gas and illuminating and calorific power. The calorific power charts are very instructive. We hope the experiences and results of a longer working period will be communicated by Mr. Nelson to his professional colleagues.

Gas Profits and the Rates.

With the coming round again of the time for the publication of the financial results of municipal gas undertakings and the consideration of the general estimates of income and expenditure of local governing bodies, there is noticed a revival of the question with regard to the desirability of allocating large sums from trading undertakings in aid of rates. Several instances of this are recorded in our news columns to-day. In the course of an interview, the Chairman of the Manchester Corporation Gas Committee said they desired to make the price of gas approach that of coal from the heating point of view; and he maintained that, if they were to retain the new customers who had come to the Department owing to the dearth and high price of coal, some reduction in charge must be made. In other words, the way to keep

what business they have obtained is to "give the customer value for his money." This is a sensible manner of looking at the matter; and the Council will do well to pay heed to the warning of the Chairman that the existing high price of gas is standing in the way of the development of the undertaking. It seems that at a forthcoming special meeting of the Council (to consider the whole of the estimates for the current year), there will be an opportunity of discussing the principle of allocating gas profits to the rates; but meanwhile it will be noted that at last week's meeting a motion to refer back to the Gas Committee the minute containing a resolution to contribute £39,340 in relief of the rates and to reduce the cost of street lighting by £10,660 was defeated. The object of this motion, it was pointed out, was to protest against the practice of granting large sums out of gas profits in aid of the rates. An unsuccessful protest was raised at Rochdale against a proposal to take from the profits of the gas and electricity undertakings in relief of the rates a sum of £1500 above that which had been decided upon by the Committee concerned. The amount offered in the first place was already a handsome one; but in spite of the strong remarks made by several speakers, the majority of the members of the Council did not consider it sufficient—the temptation of being able to avoid, by means of the augmented allocation, a substantial increase in the rates, being evidently too great to be resisted. The matter came before the Stockport Town Council in the shape of a motion to refer back a minute of the Gas Committee declining to grant a reduction of 3d. per 1000 cubic feet in the price of gas. A long discussion took place; but the resolution was unsuccessful. The case for a lower charge was replied to by the Chairman of the Gas Committee with the statement that "it was imperative that the Corporation should look for greater assistance every year from their commercial undertakings." Though these protests have been unavailing on the present occasion, they will doubtless be heard again in time to come.

Broadening the Base.

Some time ago, it was mentioned that the Institution of Electrical Engineers were proposing to broaden the base of their organization by extending membership and interests beyond the present purely technical scope. The scheme at the outset was not received by the members with unanimity. But the time that has elapsed has been spent in further discussion. A revised set of Articles of Association has been evolved; and these are to be brought forward for consideration. It is intended to have an associate class for eminent non-technical representatives of the industry; a graduate class is proposed; and the scheme also involves tests by examination for admission, so as to raise the status of the professional section of the body. But the main aim is to strengthen the Institution on the commercial and industrial side; to adopt a far-reaching policy; and to raise additional money to allow the Institution to emerge from its present confines into a sphere of greater usefulness for the industry generally.

Brighton, &c., Water Company.

With the words "Brighton Water Company" printed in large black type, and the words "Eastbourne and Bognor Crystal" sandwiched, in small type, between "Brighton" and "Water Company," a prospectus is now being circulated, offering to the public, of £5000 capital, 2250 7 per cent. preferred shares and 2223 ordinary shares of £1 each, payable 10s. on application and 10s. on allotment. The Board apparently want the money as quickly as possible. Seven per cent. preferred shares sounds good; and ordinary shares "unrestricted as to dividend" smacks of the bad old Eaton and Preston Company promoting days. Knowing that Brighton, Eastbourne, and Bognor are well supplied with water, naturally interest was aroused as to the necessity of a "Water Company" in those places. Looking lower down the face of the prospectus, we come across the name of John Maclean among the Directors; and Maclean is a name that was linked with certain of the Eaton promotions and financial wrecks. But the Board of this "Water Company" has an extraordinarily good appearance in the matter of titles; and titles are as magnets to some people, and give a feeling of security. There is Col. the Hon. H. V. Duncombe, D.S.O.; Sir J. Hawtrey Cox (Baronet); Capt. John Maclean, Barry Road, East Dulwich (a somewhat familiar address), and John Greenfield, C.E., Water Engineer. We have not the pleasure of the acquaintance of John Greenfield, C.E., Water Engineer. We do not find the name among the members of the Institution of Civil Engineers, nor in the list in our possession of the members of the Association of Water Engineers. Under the list of Directors, there are the words "An additional Director will be appointed from the list of shareholders." The correspondent who forwards the prospectus, very unkindly asks, "Will his name be Eaton?" We cannot reply to the question. Time will, or rather time may, show. It is remarked that the qualification of a Director will be satisfied by the holding of the magnificent number of ten shares; and that the minimum subscription on which the Directors may proceed to allotment is shares to the nominal value of £7. Turning to the second page of the prospectus, one has a cruel shock. It is found that the Brighton, &c., Water Company resolves itself into a mineral water company, with the centre of operations at Bognor. Enough has been said of the Company with a title printed on the prospectus in a way calculated to mislead the public.

PERSONAL.

Mr. J. S. Lucking, Manager of the Clay Cross (near Chesterfield) Gas-Works, has been appointed Assistant to the General Manager of the Oriental Gas Company, in the terms of the advertisement which appeared in the "Journal" for April 9.

Later on this month, Mr. W. Ford, of Stockton-on-Tees, will be starting on an extended holiday; it being his intention to visit Vancouver, where he will have the pleasure of seeing his son, who is Assistant to Mr. J. C. Moon at the gas-works there.

Mr. C. F. Broadhead, Gas Engineer and Manager to the Middleton Corporation, has resigned his post; having accepted the offer of a good appointment in Brisbane. At a meeting of the Town Council last Wednesday, Mr. A. Parker, in moving the adoption of the minutes of the Gas Committee, said it was with regret that he had to announce the resignation of Mr. Broadhead. He was sure they all regretted having to part with a man possessed of so many useful qualifications, and one who was so well liked by members of the Council and the men working under him.

Readers of the "Journal" are aware that the health of Mr. James W. Helps, the Engineer and General Manager of the Croydon Gas Company, has for some little time been a source of great anxiety to his colleagues and friends. After leave of absence, he returned to his duties rather more than a month ago; but though there was a marked improvement in his condition, it was considered that attention to business matters at present would be likely to affect adversely his complete recovery. Prolonged entire rest, with possibly a journey abroad later, may be thought desirable. Meanwhile, Mr. Helps has been staying with relatives in the country. Mr. Helps's many friends will, we are sure, join with us in the hope that the contemplated rest and change may prove permanently beneficial.

Chemical Manufacturers Association and Gas Bills.

We are asked to urge those who have not so far returned their replies to the questions with reference to the Alkali Manufacturers' Association opposition to Gas Bills in Parliament, to send them immediately to the Institution of Gas Engineers, 39, Victoria Street, Westminster, S.W. This is very important.

Depreciation Allowance for Income-Tax.

It is understood that the negotiations that are being carried on between delegates, representing a large number of gas companies, and the Inland Revenue authorities, with reference to the above question, are still proceeding; and there is every hope that a satisfactory settlement will be arrived at. Companies, therefore, who have assessments under appeal, are advised to take steps to get further proceedings adjourned, pending a final settlement of the negotiations.

Institution of Civil Engineers.—At the annual general meeting of the Institution last Tuesday, the result of the ballot for the election of officers for the session 1912-13 was declared. The President is Mr. Robert Elliott-Cooper; and among members of Council are Mr. W. B. Bryan, Colonel R. E. B. Crompton, C.B., Mr. E. B. Ellington, Sir Maurice Fitzmaurice, C.M.G., Mr. Walter Hunter, and Mr. H. E. Jones. They will take office on the first Tuesday in November. Among the awards for papers read during the session 1911-12 was a Telford Gold Medal to Messrs. Ernest and Walter Mansergh, for their paper on "The Supply of Water to Birmingham from Wales," noticed in the "Journal" for the 16th ult.

NOTES FROM WESTMINSTER.

THE parliamentary record for the past week is rich with interest, as will be seen by the paragraphs that succeed. Calorific power, the chemical clause, standard prices, depth of pipes, capital and revenue charges, and benefit funds are among the topics that have been vigorously discussed before Committees, and equally vigorously discussed in the corridors.

Labour Members and Co-Partnership. In the Lower House, some of the labour members are talking liberally of what they intend doing when the Gas Amalgamation Bills come within their reach. Those of their number who are letting fall oblique hints as to their Bill-blocking capacity are those who vaunt extreme socialistic principles, and not those members of the Labour Party who, through the co-operative movement, sit on the same platform with men who follow the banner of co-partnery. This is an indication of the way the wind blows. It is not amalgamation to which these extremists are antagonistic, but to the fact that one effect of the amalgamations of the present session will bring a larger number of gas-works under the flag of co-partnership. Co-partnership they regard as the enemy of trade unionism, and a social reform that confers a large amount of benefit on the participants, but has the blemish in the eyes of trade unionist leaders that it diverts money from the trade union coffers into the savings chests provided by gas companies for their employees, and which savings are afterwards turned into gas stock, thus converting the erstwhile unionists into capitalists. However, there is little fear that they will be able to accomplish anything more than a little delay in the progress of the Bills—if they venture even upon this—as the House will not allow its machinery to be kept moving for any length of time to subserve the impious motives of the little socialistic coterie, though for a time Parliament must bow to formalities and privileges. It will be remembered that the same trick was played on the Gaslight Company's Bill when the West Ham amalgamation scheme was before Parliament in 1909—Mr. Will Thorne then being one of the active blockers of the measure. The aspirations of the advanced socialistic section of the Labour Party soar high; but we do not credit with any truth the rumour—started probably by some wit—that they are going to invite the chemical manufacturers who sit in the House to join forces with them when trying to upset the Bills that will extend the blessings of co-partnership. The chemical manufacturers must draw the line of their antagonism somewhere before they reach such a point as this; and they have fixed upon self-interest as their limit.

The Gas Industry Moves. The Lord Chairman of Committees on Thursday received a deputation consisting of representatives of the Institution of Gas Engineers and the Gas Companies' Protection Association, who were desirous of protesting against the insertion of what has come to be known this session as the Chemical Clause in Gas Bills. The circumstances are well in the possession of our readers. The Institution of Gas Engineers were represented by Mr. R. G. Shadbolt (President), Mr. S. Y. Shoubridge (Hon. Secretary), and Mr. J. Ferguson Bell, who were introduced by Mr. F. E. Cooper, of Messrs. R. W. Cooper and Sons, Parliamentary Agents. The Gas Companies' Protection Association were represented by Mr. Corbet Woodall, Mr. C. E. Botley, and Mr. T. Berridge. Mr. Woodall kindly attended in place of the Chairman of the Association (Mr. H. E. Jones), who was unfortunately prevented from being present as he was giving evidence on the Wandsworth Gas Company's Bill before a House of Lords Committee. The deputation laid their views before the Lord Chairman, who promised to carefully consider the representations. The proceedings were private.

The Chemical Clause. The chemical clause has been inserted in the Wandsworth and York Gas Bills; so that Counsel for the Alkali Manufacturers' Association now begin to talk to Committees of the number of precedents that have been created this session for curtailing the powers of gas undertakings in the matter of their dealings with residuals. The merits of the question do not appear to be considered now. "Ask under any circumstances, and you shall receive" is the present intimation of the parliamentary authorities to the chemical manufacturers; and more than that, as witness the action of the Unopposed Bills Committee. Select Committees of both Houses, too, are religiously following the lead given them in the South Suburban, Annfield Plain, and Fleetwood cases. It is a singular position; and the reasons for the parliamentary authorities and Committees taking this course are altogether obscure. People are beginning to talk of the personal power and influence of the chemical manufacturers in Parliament; but are personal power and influence to have ascendancy over justice? We are loth to think that there is anything in the suggestion more than the exercise of an active imagination. However, of this there is certainty, that the chemical Free Traders in the House will in future have to vote for Protection when it comes on to the larger political platform. By their present action, they are roundly abusing their principles.

Exit Illuminating Power. When the Wandsworth and Putney, the Mitcham and Wimbledon, and Epsom and Ewell Amalgamation Bill reaches the status of an Act, it will have been altered and extended to such a degree that it will bear but scant resemblance to its original, though the principal object of the Bill—amalgamation—has not been affected. "The industry is passing through a transition period," is a hackneyed phrase; but this Bill, among its changes, emphasizes the truth of the statement. The gas industry has been anticipating the arrival of the time when illuminating power will be succeeded by calorific power as the statutory standard of quality. In the case of the large concern that will be represented by the fusion of the interests of the three Companies named, the time is already at hand; and the fact is a significant, but not unpalatable, one for the whole industry. From Jan. 1 next, if the Bill passes, as there is every prospect that it will do, a calorific power standard and test with forfeitures will take the place of the illuminating power test, though it will still be open to the local authorities to test for illuminating power if they so desire, but no penalty will attach. Now, however, that local authorities are recognizing that the illuminating power of gas is of such infinitesimal importance as compared with heating power, there is little doubt that those concerned in the area affected by the Bill will soon regard as supererogatory any testing of illuminating power for only information purposes. The advent of the suppression of the illuminating power standard, and the setting up of calorific power as the statutory standard of quality, are referred to in our editorial columns; and the clauses themselves are reproduced *in extenso* in our "Parliamentary Intelligence." The Wandsworth Amalgamation Bill will, in the history of the British gas industry, rank as the first in which the illuminating power standard was over-ridden by calorific power; the Gaslight and Coke Company's measure of 1909, the first in which a calorific power standard appeared with penalty attached, but, through uncontrollable circumstances, in conjunction with the retention of the penalty-carrying illuminating power test.

Works, Employees, and Gas Charges. Among other agreed clauses that will appear in the Wandsworth, Wimbledon, and Epsom District Gas Bill is one which will prevent the Company closing the existing Mitcham works of the Mitcham and Wimbledon Company for a period of five years, and which pledges the Company to continue to employ, within the parish of Mitcham, the same number of persons of the labouring class as were engaged by the Wimbledon Company during 1910, and to pay the same aggregate sum in wages. The influence of the West Ham clause in the Gaslight Act of 1909 is seen here. The relations of the charges to the consumers in the three districts are also dealt with. The actual price to be charged for gas supplied is to be reduced to 2s. 2d. per 1000 cubic feet within the Wimbledon limits, and to 2s. 6d. per 1000 cubic feet within the Epsom limits before the price within the Wandsworth limits is reduced below 1s. 9d. per 1000 cubic feet. Any reduction in the price of gas within the Wimbledon and the Epsom limits respectively is to be in the proportion of 2d. within the Wimbledon limits for every 3d. within the Epsom limits. When the price charged within the Wandsworth limits is 1s. 8d. per 1000 cubic feet, the price within the Wimbledon limits is to be 2s. per 1000 cubic feet, and within the Epsom limits 2s. 5d. per 1000 cubic feet. When the price within the Wandsworth limits is 1s. 7d. per 1000 cubic feet, the price within the Wimbledon limits is to be 1s. 10d. per 1000 cubic feet, and within the Epsom limits 2s. 4d. per 1000 cubic feet. If any increase in the price of gas is at any time found necessary, it is to be of the same amount throughout the whole of the Company's limits. Subject, too, to the operations of these provisions, if any decrease in the price of gas is made in any portion of the limits of supply, it is to be of the same amount throughout the whole limits of supply.

Gas-Pipe Depths. This interminable question—kept alive by certain county councils and road authorities not (to put the matter bluntly) understanding what they are asking for, and therefore not having any material reasons for the increased minimum pipe depths that they desire—was really about the only contentious point raised in connection with the Wandsworth Bill. The Surrey County Council pleaded for a minimum depth of 3 feet for all mains laid in future, instead of the 2 feet as was proposed in the Bill, unless otherwise agreed between the Company and a local authority. Mr. Talbot, K.C., on behalf of the County Council, favoured the Committee with the usual platitudinous remarks on the subject, as to the modern conditions of traffic having converted the depth that was ample a few years ago into a depth that is inadequate now, and, *ergo*, a 3-feet depth is not too great now. The evidence given for the County Council showed an "unparalleled density" (if Mr. Talbot will forgive the application of a choice oratorical titbit of his own in dealing with the evidence of a famed gas engineer) in appreciating the scientific facts underlying this question of main-laying and main injury. The fact of the matter is this question of the depth of pipes is never now, when it is more necessary than ever, properly presented and fought out before Committees. Hence the absurd variations of decisions on the subject that are found in the Committee rooms to-day. In connection with the Wandsworth Bill, we have Lord Ribblesdale and his Committee—without knowing precisely what their decree means in practice, and without knowing that depth is not the main factor as to the security of pipes—ordering that a minimum depth of 3 feet for future main laying all over this large district shall be observed; while in the York case, Lord Barnard and his Committee refused to alter the present conditions. As Mr. W. R. Herring argued, in dealing with this subject in the "JOURNAL" for March 28, 1911, the question of depth should be placed before Committees on investigations, properly and scientifically conducted on behalf of the gas industry; and, further, if the object of road authorities,

in claiming a greater depth, is merely to protect gas-pipes from surface traffic, it is only reasonable for Committees to inquire closely as to the ground upon which the claim is actually founded. Really, this important matter is dealt with altogether in a slipshod and superficial manner. Experiments in which Mr. Herring had been engaged showed that subsoil and foundations, and not depth, are the factors that determine the degree of protection from surface traffic. Evidence of actual tests—in addition to statements of personal experience, the value of which latter lay committeemen assess as merely the depositions of interested parties—is necessary before Committees on such a point as this. Mr. H. E. Jones, Mr. Charles Hunt, Mr. E. H. Stevenson, Mr. Frank Jones, and road engineers and surveyors, supplied evidence as to experience during the Wandsworth proceedings; but a minimum depth of 3 feet for pipe-laying all over the area was inserted in the Bill!

The York Bill. Proceedings on the York Bill were continued last week, and every day saw the measure before Committee for full or part sittings. It has been one of the best time-absorbing Bills of the session. Mr. Corbet Woodall and Mr. William Cash, F.C.A., were among the witnesses for the Bill the preceding week; and Mr. Henry Woodall, and Mr. J. H. Hill (Manager and Secretary of the Company) were among the further witnesses called for the Company in the past week. Mr. E. H. Stevenson was the expert for the Corporation; and Mr. W. R. Herring for the Alkali Manufacturers' Association. The main lines on which the proceedings were being conducted were sketched in last week's notes. It may be said at once, in regard to the eleventh-hour desire of the Corporation to obtain possession of the concern, that the Committee properly declined a suspensory clause. They also decided that the increased limits of supply-area desired by the Company should only be granted subject to the piping of these districts being carried out within a given period. The land was curtailed over which the Company desired manufacturing powers; the dividend was reduced from 7 to 6 per cent. on new capital (for what purpose is obscure); the chemical clause was introduced, as stated earlier in the "Notes;" but the most important thing is that the standard price was fixed at the (we believe it may be said) unprecedentedly low figure of 2s. 3d. on the Company adopting the sliding-scale. More on this point presently. The Committee refused to cumber the Company with a lot of minor impositions that the Corporation had framed in their unholy desire to make it as difficult as possible for the Company to work to the best advantage of the city. Most of the points they wanted are adequately met by the common law; and the same line of action was taken by Lord Ribblesdale and his colleagues in the Wandsworth case. Local authorities and their advisers should note this disinclination to accept frivolous amendments.

Charges to Revenue, and Standard Price. There was much said last week in the Committee rooms as to the sums that gas companies are now charging to revenue under the headings of repairs and renewals; and this matter is going to be introduced with greater freedom henceforth in connection with Bills. It is further stated that there is some likelihood of the point being raised shortly in the House itself as a matter of principle on behalf of local authorities; so that gas companies had better be prepared with their reply. There are certain things that are conveniently overlooked by those who are agitating this question. One is that those companies who have charged generously to revenue are the companies who are supplying gas at the lowest prices, and who will continue to do so. In the second place, the old charges for repairs, maintenance, and renewals are no longer any criterion of what is a fair charge now that so much money has to be spent on slot meters, prepayment consumers' fittings, cookers, and other appliances that are supplied free or on hire, and all of which go to build up a load that is fruitful in a general lower charge for gas to the consumers. Therefore, a liberal charge in connection with these things constitutes an economic policy. There is further the acknowledgment of this being a sound policy by the custom of the Local Government Board in urging upon municipal electric lighting departments to charge to revenue all such things as meters and other appliances that are, comparatively speaking, short-lived. The test of the soundness of the policy is the price at which the consumers are furnished with gas, having regard to local conditions and other circumstances that may have influenced the capital account. In the case of the York Company, the 2s. 2d. they are charging for gas is the lowest price for lighting of any Company of equal size in Yorkshire; but there was an attempt made during the proceedings on this Bill to compare this charge with the lowest prices in the United Kingdom—that is to say, in Widnes, Sheffield, Plymouth, and Wandsworth. Simultaneously, there was an attack on the charges to revenue of the York Company. Now let opponents of liberal charge to revenue, under the circumstances of to-day, ask themselves, Why it is Widnes, Sheffield, Plymouth, and Wandsworth are charging such low prices. The low charge is primarily due to the modest capital charges of to-day, which are the outcome of the policy of the past in paying attention to the capital account. One of the secrets of the low price at Widnes is the comparatively small capital account that the gas undertaking has at the present time; and Mr. Isaac Carr is prepared to fight tooth and nail to prevent his profits being transferred from benefiting the undertaking to aiding the rates, and thus from benefiting gas consumers through the undertaking. The opposition in the York case pointed to the accepted principle that the lower the price, the greater the output. True; and just as true is the fact that the higher the capital charges, the higher the price to the consumers. It is better for the consumers to spend liberally through the revenue account in a manner that will keep down the capital, than to permanently increase the load of capital charges. We submit that—within limits—the money that would be required for the permanent additional capital charges is better spent currently on preventing this permanent addition. That is the lesson of the low-priced gas undertakings to-day. Limitation of dividend and the sliding-scale absolutely protect consumers, as is seen when the matter is examined fairly and squarely from the economic standpoint. There is no question about this. If the charges to repairs and renewals had anything to do in the case of York with the fixing, by Lord Barnard and his colleagues, of the low standard price of 2s. 3d.—the lowest standard price of which we know—with the Company's price to consumers standing at 2s. 2d. to-day, then there has been no exercise of those *a priori* considerations that, in such matters as this, should govern the judicial decisions of Committees. Mr. Stevenson and the Corporation argued for a 2s. standard price; their arguments were not based upon the practical object lessons that the gas industry affords us to-day.

Wakefield Gas. The Wakefield Gas Company's Bill was under consideration by Lord Barnard's Committee during part of the sittings on Wednesday, Thursday, and Friday. But at the rising for the week on Friday, the proceedings had not been concluded; and therefore notice of them (apart from the report in our "Parliamentary Intelligence") may be deferred until next week.

Benefit Funds. We have never been able to properly fathom the opposition of the Brighton Corporation to the Benefit Funds Bill, a large amount of credit for the origination of which beneficent measure is generally ascribed to Mr. A. M. Paddon, the Chairman of the Brighton and Hove Gas Company. The Brighton Corporation obtained just the rebuff that they deserved from the Marquis of Bath and his colleagues, when the Bill applying to the Brighton and Hove Company came before them. Originally there were seven gas companies concerned in one measure; but the authorities of the House decided that, instead of a joint Bill, the Companies—Brighton and Hove, East Cowes, St. Albans, Lea Bridge, Maidenhead, Southgate, and North Middlesex—should each have a Bill on its own account. The Bills of the last four Companies have passed the Unopposed Bills Committee; the Brighton Bill came before a Lords Committee last Thursday. All that the Companies are asking is that a fund should be allowed to be built up, for the purpose of workmen's pensions and other benefits, by ¼d. appropriations per 1000 cubic feet sold—the total at no time to exceed the sum of five years' contributions. Mr. E. L. Burton, the Secretary of the Brighton Company, showed that the proposal secures to the workmen and their dependants benefits that have hitherto been conferred voluntarily. Hence the argument of the Corporation that the establishment of this fund would retard the reduction in the price of gas was shown to be barren and paltry. The opposition was altogether unreasonable. The Brighton Corporation ought to have known that their visit to Westminster on this particular errand could only result in the ratepayers having to pay a bill for parliamentary costs; and this is not the first time that antagonism to the Gas Company has had a like effect.

Private Tunnels and Main Laying. There are two or three Bills in Parliament this session which contain a clause in like terms that has its origin in the case of *Schweder v. Worthing Gas Company*. We remarked upon this in reviewing the Bills at the beginning of the year. The clause provides a modification of the Gas-Works Clauses Act of 1847, by providing that any tunnel, arch, vault, or building beneath the surface of any street shall be deemed a tunnel to which the provisions with regard to the breaking-up of the streets for the purpose of laying pipes shall apply, and shall not be deemed to be a building within the meaning of section 7 of the General Act. When the Christchurch Gas Company's Bill was before the Marquis of Bristol's Committee last Tuesday, it transpired that the Home Office had called attention to the fact that there was no precedent for this clause, and that the Lord Chairman has the matter under consideration. There may be no precedent for the clause, but the Worthing case showed the need. The only point that raised controversy in connection with the Christchurch Bill was the question of a new site for the gas-works. A couple of private property owners were up in quest of compensation; but evidence by Mr. Henry Woodall, Mr. Harold Woodall, and Mr. Cash quashed the case of the opponents.

Lead-Poisoning. In West Riding Water Bills at various times clauses have been inserted requiring the water to be treated in order to relieve it of any plumbo-solvent action to prevent lead-poisoning. When the clauses of the Bill of the Fylde Water Board were last week under consideration, by Sir Charles Rose's Committee, the West Riding County Council tried to persuade the Committee to insert the provision; but the promoters offered an alternative, which provides an obligation to treat the water if the Local Government Board insist upon it. This alternative the Committee accepted.

At a special meeting of the Leicester Town Council last Wednesday, Alderman Sir William Vincent (twice Mayor of the Borough and Vice-Chairman of the Derwent Valley Water Board) was presented with the honorary freedom.

ELECTRICITY SUPPLY MEMORANDA.

Mr. Matthews on Shrinkage Extraordinary—A Few Questions—Evasion Always—Lifting the Curtain on Metalite Limited—Happy Hampstead—Secret Rates—Another Fatal Mystery Fire.

We are a little surprised that Mr. R. Borlaise Matthews should continue to append his name to extraordinary statements regarding the relative wastage of meat cooked in electric and gas ovens, and that the "Electrical Review" should print these statements. In an article published in that paper, Mr. Matthews states that "to obtain 12 lbs. weight of meat ready cooked and available for serving, it is necessary to put 13 lbs. 10 oz. into an electric-oven; but if the cooking is to be done in any other way, at least 17 lbs. 2 oz. will have to be put into the oven, showing an economy in weight of 3 lbs. 8 oz., or in hard cash of 2s. 11d., whereas the actual cost of cooking the joint, either by electricity or gas, would only be in the neighbourhood of 3d." We will not, on this occasion, discuss these particular figures, beyond pointing out that Mr. Matthews suggests by them a shrinkage of 5 lb. 2 oz. in the gas-cooked joint—that is to say, he makes out there is a shrinkage equal to about 5 oz. per lb. We shall be glad to enter into this matter a little further with Mr. Matthews, if he will preface the discussion with replies to a few questions. The first is, Whether this statement is the result of a test carried out by himself? The second is, If not, by whom was it carried out? Thirdly, What gas-stove was used? Fourthly, Were the joints equally well done? If the gas-cooked joint was done more than the electric-cooked joint, Why was not the temperature of the gas-oven regulated so that the joint was not cooked more than the latter, and why was not the joint removed at the stage at which it was regarded as being properly cooked according to Mr. Matthews notions, which notions, we take it, have as their standard the condition of the electrically cooked joint? The next question is, Will Mr. Matthews say that it is impossible to regulate heats, and to carry out the baking of joints in a gas-oven, so that the weight is approximately (regard being paid to any variations in the constitution of the joint) that of a joint cooked, to also approximately, the same degree—well done, underdone, or to any intermediate stage as desired—in an electric oven?

Now if Mr. Matthews has the courage of the opinions expressed in his writings on the subject of cooking in electric and gas ovens, he will say it is impossible. If he does say it is impossible, will he be prepared to join in some tests with both forms of oven, the joints being cooked to the same degree in each—that is to say, the gas joint being removed when it has reached the stage of cooking which it is considered will be the equivalent of the joint in the electric-oven? Then, if his published statements are not verified, will he assist the gas industry in its publicity work by apologizing for the statements of which he is the author, as to the wide variation in the weight of joints cooked by both methods, and, we suppose that he would have his readers presume, to the same degree. If not to the same degree, why not? It is further noticed that he reckons the difference he alleges in weight between the two methods of cooking the joints at 10d. per lb.; and so makes out a saving of 2s. 11d. Was it not the "Electrical Review" that some time since deprecated such an absurd piece of procedure as charging up evaporated moisture at the price of the solid raw meat? Our contemporary ought to severely censure this apostle of the modern mode of appraising the value of the volatile ingredient of meat. It is bad enough for a platform orator or agent of any firm of electric-oven manufacturers to do this sort of thing. But for Mr. R. Borlaise Matthews, a member of the Institution of Electrical Engineers, to do it in the columns of a technical paper——well, well! perhaps it is more courteous that we should keep private our thoughts (both first and second) on the subject.

When are the "Electrician" and Mr. Grogan really going to toe the line, and discuss fully and straightforwardly the questions raised in connection with culinary operations. There is someone on the "Electrician" staff who is very friendly with the said Mr. Grogan; and the pair seem to have one characteristic in common, and that is a wonderful proficiency in making wide detours of all the, to them, awkward points in the controversy that was originally raised by Mr. Grogan's persistent attack on the gas-oven. They will not deal with anything that really matters in the controversy. There are the Brighton tests. One item in the many figures was wrong; all the others were capable of being established before the eyes of Mr. Grogan if he had taken advantage of our suggestion when in Brighton of having the tests repeated with the same appliances by the same members of the staff of the Gas Company, and then attesting his satisfaction as to their accuracy. But Mr. Grogan apparently thought it discreet to keep away from any such damaging (to electric cookery) demonstration, so as not to be called upon to put his signature to a certificate as to the accuracy of the tests. Never yet have we been able to draw him into our columns. He had an opportunity again this week. Once more dead-silence. But about that single mistake in the Brighton tests. It was pounced upon as though it alone constituted the whole of the information contained in the series of tests. It was, of course, the easiest thing for these people to deal with. Mr. Grogan raved about it; his friend on the "Electrician" did ditto. Mr. Cash, when Mr. Grogan called attention to the one error, had the test repeated, and publicly acknowledged the mistake, which acknowledgment still showed the cost of electricity for the purpose at 1d. per unit to be double that of gas at 2s. 10d. per 1000 cubic feet. This is the paltry way the "Electrician" refers to Mr. Cash's frank acknowledgment of the one error: "Mr. Cash has apologized to the whole electrical industry through the columns of the 'Journal of Gas Lighting.' How much more gracious the acknowledgment of the mistake of his assistants would have appeared if sent to us for our own columns." The conceit of the "Electrician!" We have not seen any apology "to the whole electrical industry." The mistake appeared in our columns, and not in the "Electrician." To our readers and to those among whom had been circulated the single error in a multitude of truths, Mr. Cash, as any gentleman would have done, expressed his apology and made the correction, and did not run away. Why the correction and apology should have been sent to the "Electrician" is not clear. Mr. Cash had the test repeated when a representative of the "Tricity" people called attention to it; so that the absurd and puerile self-gratification of the "Electrician"—as expressed in the words "*We* have at last wrung from Mr. Cash"—is altogether misplaced, or perhaps we should say would be misplaced in an ordinary technical journal. Mr. Grogan has never been "gracious" enough to reply to our criticisms in the "Journal" columns. He has always preferred the haven offered him by the "Electrician." Now let our contemporary settle down, with or without Mr. Grogan's help, and deal from beginning to end with the Brighton test results seriatim, as well as with our criticism of Mr. Grogan's recent letter (pp. 283-4). Let us have something solid, and less frothy. Up to the present, numbers of the readers of the "Electrician" cannot know anything of the matter under discussion, as there has been a careful exclusion from the columns of our contemporary of the article that incorporated the Brighton tests.

Big drums were beaten, and a great noise made, when Metalite Limited was launched upon a world that was told the lamps the Company were going to produce were to lead electric lighting through economy to such a victory over gas that the shares of the Company were most desirable property in which to invest. The challenges that were issued to the promoters of the Company to prove the statements regarding the economical superiority of "Metalite" lamps over incandescent gas lighting were not taken up. The assumed bold manner in which the erroneous statements were made, and the manner in which the people responsible for them kept quiet when challenged for proof, supplied a ludicrous contrast. After the great outburst, and the floating of the Company, there was almost a deathly calm; and the public have not lately been taken so largely into the confidence of the Company as to what they have been doing. But the curtain was raised in the Companies' Winding-up Court last Tuesday, when Mr. Justice Swinfen Eady heard the petition of certain shareholders for the compulsory winding-up of the Company. All the first Directors excepting one, it appears, have retired; and two other Directors have been elected. The flotation seems to have been a failure. According to Mr. F. Russell, K.C., there is no less than £51,831 in arrear in respect of calls; and for this the promoting companies are responsible. It is asserted that the public only subscribed £24,000. Large profits were predicted in the prospectus; the first year's trading showed a loss of upwards of £6000 without taking into account administration expenses. However, the petition for winding up did not succeed, as his Lordship felt, though there had been grave irregularities in the management of the Company's affairs, this was not necessarily and alone a sufficient cause for winding-up. He appeared satisfied from the evidence that the Company had a well-equipped factory, that it was continuing to manufacture lamps, that it was making a profit, and that its business was increasing. However, what is most interesting to us is the disclosure that the public declined to swallow the predictions that the Company had a rich gold mine simply waiting to be worked, and that the Company's lamp, by its effulgent merit, was going to wipe gas lighting off the face of the earth.

An echo of the Hampstead public lighting scandal has been heard. The circumstances will be remembered. They could hardly be otherwise, seeing that they included such striking features as an excess expenditure of £10,326 on the conversion of the public lamps from gas to electricity, or an increase of from £6 15s. 3d. per post to £10 15s. 4d., notice to the Electrical Engineer (Mr. G. H. Cottam) to quit, and the prompt dismissal of the Chief Assistant Engineer (Mr. E. Sayer), who just as promptly issued a writ against the Council claiming damages for wrongful dismissal. Some of the councillors were for fighting Mr. Sayer on the ground he selected; but the majority are for keeping the washing of dirty linen as much at home as possible. Some of them have not yet got over the sneers of the public at such an excess expenditure as upwards of £10,000 going on under their very noses, with the production of something much worse than they had before in the street-lamps. The cry of inferior lighting by the ratepayers was both long and loud until the Electricity Committee thought that something must be done to quiet their assailants. However, the Council are proposing to protect themselves against this sort of thing happening again; and there is a proposal on foot now to create a substantial official barricade. They are suggesting dividing the work of the department into four parts, with at the head of each a responsible official, and over the whole lot a Chief Engineer. The divisional officers are a station engineer, an electricity accountant, a mains engineer, and a commercial manager. But then the excess of £10,326 has already been expended, and is irrecoverable, and still the ratepayers are not satisfied, despite the costly character of the public lighting conversion. To properly conduct an electric lighting

concern, according to the modern ideas of the Hampstead councillors, is a costly and delicate matter.

Some electricity committees of local authorities have a very deep horror of the public learning the rates at which they enter into some of their contracts for electricity. Nearly all of them seem to have an open and a secret tariff of charges. If the business is of a fair and defensible order, there ought to be no difficulty over the question of publicity. But there it is—some committees are almost frightened out of their senses when there is any prospect of disclosure. We remember well the trouble that a Local Government Board Inspector had in regard to this matter with one of the East-end of London authorities when inquiring into the subject of a loan; and the Electricity Committee were so afraid to divulge (and were therefore so obstinate about doing so) the lowest of the differential rates they were charging to power users (though they ought to have been perfectly able to vindicate them) that the question of the granting of the loan for a time came to a deadlock. The same fear has lately been exhibited by the Electricity Committee of the Hammersmith Borough Council in connection with the renewal of a contract for the supply of electricity for seven years to the New Olympia Company, Limited. This supply of current to Olympia is rather interesting to the gas industry, because the agreement appears to carry with it the sole right to light the building and the stands at exhibitions, and (if we understand correctly) the Electricity Department over this matter of stand lighting are disposed to act the part of the dog in the manger. There was a little trouble we know over the magnificent stand of the South Metropolitan Company at the Ideal Home Exhibition. The only thing the Hammersmith Borough Council Electricity Department do not appear to object to is the use of a few old flat-flame gas-burners as stand-bys during exhibitions. Probably, the New Olympia Company are not anxious to have to meet any responsibility in a public building that might devolve upon them in the event of a collapse of the electric light accompanied by panic.

However, the contract the Electricity Committee have with the Olympia Company does not end until January next year; and the Committee are eager to at once close with them for another contract for a period of seven years from Jan. 26 next. The gas industry is interested in this. Next year the Institution of Gas Engineers will be holding their Jubilee Gas Exhibition; but Olympia is put out of court as the place for the exhibition partly owing to the Hammersmith electricity contract. But what do the Hammersmith ratepayers pay for the privilege of supplying electricity to Olympia, and saving the Electricity Committee from competing with the local gas suppliers at exhibitions? Really there ought not to be any necessity for the Committee to have to come down to any such figure that they dare not disclose it to the ratepayers. Olympia does not offer the department a constant load. It is only a spasmodic supply; and so there does not seem to be any substantial reason why they should go to such lengths as apparently they are doing in obtaining this contract. When the recommendation for a seven years' renewal came before the Council the other day, there were members who wanted more particulars as to the nature of the contract; and one councillor thought the ratepayers were entitled to have the facts equally with the members of the Committee. In short, there was a feeling that Olympia was getting preferential treatment; but no one seemed very clear as to why. This feeling was intensified by the Mayor stating that there were many things in this connection that it would not be well to advertise to the world. A majority of the Council were resolved that the ratepayers should not learn the particulars of this contract, and so it was discussed *in camera*. We repeat that if the rate for the current is a defensible one, there ought to be no fear as to publicity. The Hammersmith Council have not any electricity supply competitor in their area, unless the Olympia Company choose to put down a private generating plant driven by a gas-engine. Under these circumstances, the ratepayers ought all to know the real reason for the Electricity Committee's secrecy.

The recent fatal fire at Portsea, which claimed four victims—Mrs. Flora Brentman, two of her children, and a domestic servant—has caused a great deal of speculation as to the origin. The fire appears to have broken out (after the family had retired to rest) in the shop of the premises, which shop and the sitting-room were lighted electrically. The gas supply had been entirely cut-off from the premises; and in the bedrooms candles only were used. Mr. Brentman suggests that one of the electric wires fused; but Inspector Ogburn, Chief of the Fire Brigade, is more cautious, and says he is positively unable to suggest a cause. On the other hand Mr. A. Hiscock, the Mains Engineer in the employ of the Portsmouth Corporation Electricity Department, has come to the conclusion that no current was in the shop beyond the switchboard when the fire occurred. The installation, too, was in steel tubing; and he was sure there could not have been any fusing. After such a severe fire, with its origin eliminating power, it is difficult, without further explanation, to appreciate the grounds on which Mr. Hiscock places so much confidence.

In one of the "Personal" paragraphs in the current number of the "Co-Partnership Journal" of the South Metropolitan Gas Company it is stated that Mr. H. T. Manley, of the Old Kent Road station, has been appointed a member of the Advisory Committee for England formed in connection with the National Insurance Act.

IDEAL EXHIBITIONS FOR ADVERTISING AND FOR EDUCATIONAL WORK.

It may be said without any fear of contradiction that the responsible heads of the South Metropolitan Gas Company would be prepared to-day to lay it down as a general proposition that the value of an exhibition for advertising or educational purposes depends entirely upon the purpose for which the public are attracted to the show—no matter whether it is gas, electricity, or anything else that is the commodity to be advertised, and to have its merits and uses made known. The experience of the Company at the Ideal Home Exhibition, we venture to say, accentuated the belief that the responsible heads may have previously entertained on the point. Be that as it may, the Ideal Home Exhibition affords an excellent illustration of the meaning of the proposition advanced in the opening lines of this article. People who were attracted to Olympia by the tens of thousands went to the show not for entertainment, but with the fixed purpose of seeing what was new for effecting improvements in the home. To the majority of Britishers, "home" has a very big meaning; and the home is something for which every one of this great majority has a deep-seated affection. And within their means, a large proportion of the community are prepared to spend reasonably on the improvement of their homes. The tens of thousands who went to the Ideal Home Exhibition, and most of whom paid their shillings readily at the turnstiles, did not pass the stands with merely a side glance. For them every stand had a contributory part in the purpose for which the visit was paid to Olympia. New ideas in furnishing and in beautifying the home, and in adding to the conveniences of home life, were of paramount importance in the minds of most of the visitors; and side-shows for entertainment purposes merely would have been relegated by them to places of secondary importance. Such is the effect of purpose.

The South Metropolitan Gas Company's stand at Olympia—upon the beauty and attractiveness of which all who saw it (and many gas men did so from all parts of the kingdom) made due acknowledgment—shared in the attentions of the vast public who went to the Ideal Home Exhibition; and the Company have enjoyed an agreeable amount of genuine business from it—purely due, it may be held, to the motives for which the public attended the exhibition. The delicacy of the work about the stand, the beauty of the gas-lighting fittings, the quality of the lights, the conveniences of the fires, cookers, irons, circulating-boilers, and geysers all harmonized with the thoughts and notions surrounding the ideal home. Consequently, four male attendants were kept busy imparting information as to the general applications of gas for lighting, heating, and cooking; and two lady attendants aided in the educational work—one demonstrating the uses of gas for providing hot water in bulk and otherwise; the other the use of gas for ironing. The stand was at times almost unapproachable owing to the number of people attracted by it. Very few of the inquiries made, the attendants testify, were purely casual ones; the majority of their visitors put questions and showed an interest that indicated a serious desire for intelligence as to how their homes could be improved by modern gas appliances—by, in lighting, passing from their old-fashioned fittings to the modern artistic and inverted types, and by adopting other of the several conveniences offered by gas, and producing a saving of labour, dust, and dirt, and an economy of time and money. Just as an indication of the business that was done, it may be mentioned that inquiries were registered in regard to between 130 and 140 hot-water circulators. This is only an example; and does not comprehend any other inquiries and business done in the several lines composed by the manifold applications of gas. As has been said, the inquiries have led to genuine business.

We do not know whether it is revealing a domestic secret, but will risk this further piece of information as bearing upon the point with which this article started, as to the relationship of motive in attending exhibitions with actual business done. At the end of last week, it was ascertained that the Company had dealt with at least 80 per cent. of the inquiries made at the Ideal Home Exhibition, and of this 80 per cent. 73 per cent. of the inquirers had accepted the estimates that had been submitted to them by the Company. This is genuine business; and it is rather startling, and certainly persuasive in shaping views as to the character of exhibitions at which to exhibit, when it is brought into comparison with some experiences at other exhibitions.

This is not the last Ideal Home Exhibition. The progressive success of these shows leads to the anticipation that they will become almost a permanent institution. Anyway, there will be another next year; and the proved advertising and educational values of these shows are already appealing to people who have something for sale that they believe will improve, or add to the conveniences of, the home. The gas industry should not lose sight of representation at next year's show; and there should certainly be an early consideration of the question of space for a combined display there. The electrical industry are being urged to consider the matter of its adequate representation next year. They believe that a grand opportunity was lost this year; and the South Metropolitan stand has stimulated this belief. The matter should at once be looked into by the British Commercial Gas Association; and advantage should be taken of this year's experience at Olympia. We do not know, but we should not be

surprised to learn, that if the British Commercial Gas Association do not move in this matter, the Company who gained such excellent experience at the exhibition this year will be inclined to repeat it. But that is a matter on which we have no knowledge nor any authority to speak, beyond the view engendered by the information gathered as to the recent experience.

The number of visitors who passed the turnstiles at this year's exhibition was well over 300,000.

A SHOW-ROOM AT KING'S NORTON.

THERE was formally opened at the beginning of this month an attractive looking building in the Georgian style facing the tramway terminus at King's Norton, which is to serve the useful purpose of a branch office and show-room for the Birmingham Corporation Gas Department. The site selected (which is close to the valve-house in connection with the high-pressure main from the works, some six or seven miles away) is an excellent one; and everything in connection with the premises has been so well

arranged that congratulations are due to those responsible—including the Architects (Messrs. Cossins and Peacock).

To begin at the bottom, there are large and well-lighted stores, and ample accommodation for those attending the lectures and demonstrations which it is intended to give from time to time. The depôt is to serve as a call office for the district fitters; and as it will be in telephonic communication with the head office, much delay will be saved in the carrying-out of orders. On the ground floor is the show-room, with large window-space. From the accompanying photographs (for which we are indebted to Mr. R. S. Hilton, Secretary and Manager of the Gas Department) it will be noticed that every possible care has been taken to show the goods displayed to the very best advantage. In the first place, any semblance of over-crowding has been studiously avoided; and, secondly, the different things have been arranged to form a perfectly harmonious whole. Added to this, it need hardly be said, a judicious selection has been made of goods for exhibition; so that in all respects it may, without undue praise, be termed a

model show-room. Housewives coming to the depôt to pay their gas accounts will find the counter in the show-room; and (if the clerk is not too quick in making out the receipts) their eyes are certain to wander over the tempting-looking articles with which they will be surrounded. In a large number of cases, it is perfectly safe to assume, a desire will be felt for closer acquaintance with one or more of these goods; and this can be made in comfort—nay, even in luxury. The top portion of the walls is in grey; and below this there is green tiling—an excellent background for the stoves, &c., that are on view. In the matter of the fires, fittings, and other things to be seen, we will not here particularize; but it may be remarked that the fires are shown both with overmantels and fitted close against the wall. In one corner of the room there is a convenient staircase, which leads to the next floor, where a large assortment of chandeliers, brackets, fires, and so on, have been arranged.

Forming part of the same building as this model show-room, is a model house, where the clerk-in-charge is to reside; and this has been fitted up for the use of gas alone for all heating, cooking, and lighting purposes. Here, again, the fires, fittings, &c., have been well chosen, and are of the most modern patterns. In the kitchen there is a combined gas-cooker and fire in which special pride is taken by Mr. S. R. Barrett, the Fittings Superintendent to the Gas Department—a special feature of the arrangement being the provision of a boiler over the fire, so that the heat passing away from the top furnishes a supply of hot water so long as the fire is in use. This is, of course, not the only source of hot water—a general supply of which for the house is obtained by means of a circulator fitted with thermostatic control.

Both the inhabitants of King's Norton and the Birmingham Gas Department will benefit from this further development of the "commercial side;" and anyone desirous of seeing what can be done by gas may be enlightened by a visit to the model house.

A SIMPLE PRESSURE LIGHTER AND EXTINGUISHER FOR GAS-LAMPS.

In the "Journal" for April 16 (p. 169), there appeared the abstract of a patent specification of a very simple lamp distance lighter and extinguisher, the mechanism of which can be arranged to operate either by the application of an increased pressure above a given district pressure, or by a reduction of pressure below a given district pressure. The contrivance is the invention of Mr. T. M. Sandiford, of Masterton, New Zealand. It is interesting to see that, in the automatic control of gas-lamps, New Zealand presents us with a workable contribution, which appears to have points of special recommendation. It was quite a coincidence that the abstract of the specification should have been published by us so recently, and that a few days ago, Mr. Malcolm Moorhouse, of Masterton, should have walked into our office bringing with him from that far-off town a home-made example of the new lamp-controller. We have been interested in examining it, and in ascertaining the points upon which the inventor relies for obtaining for it favour. Let us say at once that simplicity of mechanism and action, inexpensive parts that seem to be endowed with everlasting life, and therefore low-cost production and maintenance, are among the outstanding features of the new arrangement. Looking at the extreme simplicity, we are under the impression that more will be heard of this pressure lighter and extinguisher.

The detailed description of the device that has appeared in our columns from the patent specification is right and proper in its way; but the wordy—perhaps necessarily wordy—mode of patent specifications invariably gives an idea of complicated parts and a wonderfully contrived organism. Having the device of Mr. Sandiford before us, and separating its parts, it is found that comparatively few lines will explain it. The whole is contained in a strongly-made outer cylindrical case, with cover. There is a shallow circular inner casing which is covered by a bell, sealed in mercury contained in the annular space formed by the outer and the inner casings. The bell is kept in a central position by a pin, which rides up and down with the bell by the action of the gas pressure operating the mechanism. Upon this central pin, externally to the bell, is a screw-piece which holds the bell tightly to the mechanism, and also serves as a peg for carrying the weights which determine the point of pressure at which the mechanism is to come into action. We will deal with the device as arranged to work by an increase of pressure. The central guide-pin to which the bell is attached works in a small vertical cylinder, which is connected with the gas-supply pipe. A bridge-piece is also attached to the central pin; and, on one side, the bridge carries a movable link, which engages with a toothed wheel, which, in turn, operates a drum in a small horizontally placed cylinder. There is a perforation in the outer horizontal cylinder, forming a gas-outlet to the bell. The inner drum is also perforated at accurately measured distances. Now suppose the maximum district pressure is 3 inches, the bell is weighted to resist this maximum pressure. On the pressure at the gas-works being increased temporarily beyond this maximum pressure, the effect is to increase the pressure in the gas chamber and to cause the bell to rise, carrying with it the bridge-piece and the link, which link engages with the toothed wheel, and gives it one turn—thus bringing one of the apertures of the inner horizontal drum into communication with the gas-supply pipe to the burner or burners, which are at once lighted up by the bye-pass jets. The pressure at the works is again decreased to normal point, the bell in each lamp-controller descends, and, in doing so, the moveable link simply slides over the teeth of the drum-operating wheel, which is prevented by a spring making backward movement through friction. When it is desired to extinguish the lights, the same cycle of actions is followed, excepting that, on this occasion, the horizontal drum is moved one pace, so that a blank covers the supply-pipe leading to the burner, and gas communication is thus cut off.

That is the whole arrangement and method of operation. We have not seen the contrivance in action; so that it is impossible to speak of it in any other way than to say that the claims as to strength, simplicity of parts and of operation, and of low-cost construction are manifest by the inspection. As to the reliability of action, Mr. Moorhouse (who is at present staying at 78, Stapleton Road, Upper Tooting, S.W.) bears testimony, from personal experience with the lamps in the streets of distant Masterton.

OBITUARY.

SAMUEL WILLIAM LUDBROOK.

We regret to record the death, last Tuesday, at "The Glen," Hornchurch, Essex, in his sixty-third year, of Mr. Samuel William Ludbrook, who had been for forty-seven years associated with the Commercial Gas Company. He entered their service at the age of sixteen, and for some years worked in the drawing office at the Stepney works, under the Chief Engineer, Mr. Robert Jones, and later under Mr. H. E. Jones. When the Poplar works were built in 1880, to the designs of Mr. H. E. Jones, Mr. Ludbrook prepared the drawings and later supervised the work. On its completion, he was left in charge as Engineer and Manager; and he held this position for some twenty years. Later, in 1901, he was transferred to the Company's headquarters at Stepney; taking an active part in the management of the works, and also as Constructional Engineer to the Company under the then new Chief Engineer, Mr. Stanley H. Jones.

Mr. Ludbrook was very popular with all grades of the Company's staff. He had an amiable disposition and many very lovable qualities. He made many friends, and certainly had no enemies. As an engineer, he displayed great skill, and was quite in his element in all classes of constructional work. He possessed considerable ingenuity and resource; and the greater the difficulty of the work, the more did he excel in the design and construction. He was a very straightforward man, and was much liked by the workmen who served under him. He was an amateur artist of no mean order. Recently he had lived at Hornchurch, in delightful surroundings, and had taken much interest in gardening. Some seven years ago, he invented a simple and ingenious coke-pusher, electrically driven, which has for many years given great satisfaction in the retort-house at the Stepney works, working almost without a hitch. No machine could be more simple in its construction, nor work more smoothly.

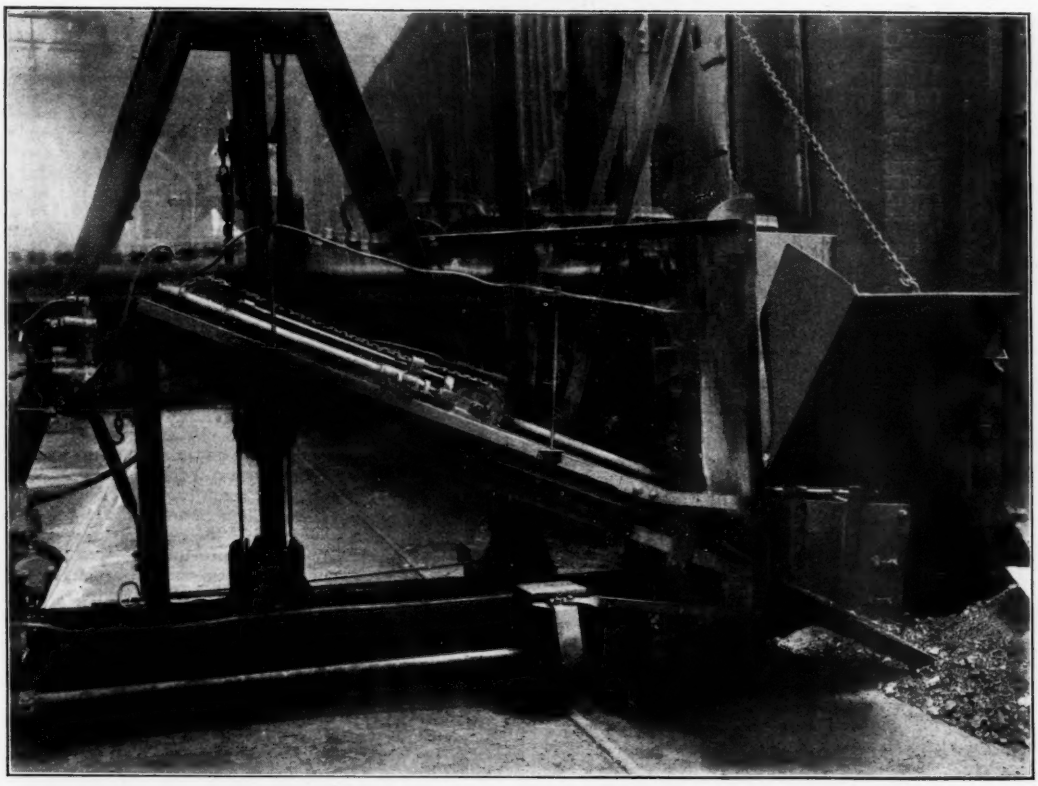
The deceased had been in rather bad health for the past year or so. He continued in harness to within a couple of weeks of his death, which was finally caused by a wasting disease. Mr. Ludbrook was for many years an associate member of the Institution of Civil Engineers; but he was not very well known personally by his colleagues in the gas profession, as he rarely, if ever, attended meetings of the Institution or other Associations. By those who knew him best, he was recognized as a very capable engineer, who was always much interested in his work, and progressive and up-to-date in his ideas. He leaves a widow and daughter. The funeral took place at Ilford Cemetery last Friday.

The death took place suddenly at Langbank, on the 28th ult., of Mr. James Renfrew, who had been the Manager of the Langbank Gas Company's works since the Company was constituted 42 years ago. Mr. Renfrew was 69 years of age, and was a native of Renfrew.

The death is recorded of Mr. Gabriel Dyson, who for many years was Water Engineer to the Colne Corporation. He was Manager of the old Water Company, and when the undertaking was acquired by the local authorities in 1881, his services were retained. He resigned in 1885, but again took up the management of the water-works in 1891, and continued his duties down to 1909, when he finally retired. He was eighty years of age.

The death occurred last Wednesday morning, at his residence at Gosport, of Mr. George B. Irons, formerly Manager and Secretary of the Gosport Gas Company, with which he was connected for about forty-six years. Deceased, who was in his eighty-second year, was known to the older members of the gas profession. He joined the British Association of Gas Managers in 1866, passed into the Gas Institute, and subsequently into the present Institution, of which he was a member at the time of his death. He was also a member of the old South-West of England Association, and went into the Southern District Association on the amalgamation of the two bodies in 1896. The death of Mr. Irons caused great regret among his private friends and the public generally; and there was a large attendance at the funeral.

GILL'S PATENT FURNACE-CHARGING MACHINE.



One of the most arduous duties of the retort-house is the filling of the furnaces. This work has usually to be performed in the presence of much heat, which, combined with the manual exertion required, renders it unpopular with the stokers. A machine designed to do the work by power has been in regular use for the past six months at the Wapping station of the Commercial Gas Company; and it is shown in the accompanying illustration. The work is not only done more quickly—and it certainly takes no longer than one minute to push half-a-ton of coke into the furnace—but is also done at very little cost. The "poking-in" draw is usually considered to be much more laborious than the ordinary draw, and generally requires a larger number of men to get through the extra work. As a consequence, it is often necessary to include sufficient men in each shift to do the additional work necessitated by the filling-of the furnaces. The machine under notice obviates this difficulty and renders the "poking-in" draw quite as easy as any other.

The machine, which is the subject of a patent by the Station Engineer, Mr. G. M. Gill, may be driven by hydraulic power, as in the illustration, by electricity, or by compressed air. It may be either attached to the drawing-rake or coke-pusher, or may be fitted on its own framework, running on rails alongside the furnaces. As it is inexpensive, it should pay for itself many times over in the course of a year. It is being placed on the market by Messrs. W. J. Jenkins and Co., Limited, of Retford.

CENTENARY OF THE INTRODUCTION OF GAS AS AN ILLUMINANT.

[From an American Correspondent.]

In writing recently of the coming celebration in this country of the hundredth anniversary of the Chartered Company [see "Journal" for March 26, p. 863], I spoke of the ties that bound us to the Mother Country. Little did we think then that the next common bond would be one of participation and of sympathy in a marine disaster as horrible as unexpected, whose only redeeming feature was the heroism shown by men of Anglo-Saxon stock. The centenary celebration, beginning as it did on Thursday night, April 18, and continuing through Friday, April 19, coincided with the climax of the *Titanic* tragedy—the arrival of the *Carpathia*, and with it definite knowledge of the lost. To the writer at least, it was a great relief to be able, on Friday, to escape from present horrors and lose himself while listening to the development of the gas industry.

As has been said before, the celebration was held under the joint auspices of the American Philosophical Society, the Franklin Institute, the American Chemical Society, and the American Gas Institute. Unfortunately, Mr. Walton Clark, the President of the Franklin Institute, and well known to gas men here and abroad as a Vice-President of the United Gas Improvement Company, was absent in Egypt, while Mr. Ira C. Copley, the President of the American Gas Institute, was recovering from diphtheria; so neither could act on behalf of his Society. The sessions were held in Philadelphia (Pa.), in the hall of the Franklin Institute. This was erected in 1828; and from the standpoint of epoch-making lectures, occupies nearly the same position in this country as the hall of the Royal Institution does in England. It was quite a fitting place for the celebration of a gas centenary, as it was a President of the Franklin Institute who visited Europe about 1830 to investigate the status of the gas business, and whose favourable report resulted in his being entrusted with the erection of the Philadelphia Gas-Works.

The meeting was called to order Thursday evening by Dr. W. W. Keen, the President of the American Philosophical Society, who, after a few remarks on the great part played by gas in adding to the sum of human welfare, introduced the first lecturer. This was Dr. Charles E. Munroe, of Washington (D.C.), Professor of Chemistry and Dean of the School of Graduate Studies in the George Washington University. His subject was "Bye-Products in Gas Manufacture;" and, with the art flowing from thorough knowledge, he traced the gradual development in the utilization of our bye-products—a development which has helped not only the user of the bye-product, but to an even greater extent the gas consumer, through the price reduction made possible solely because of revenue from residuals.

On Friday, at ten, Mr. A. D. Little, the President of the American Chemical Society, took the chair and presented the Honourable George B. Cortelyou, the President of the Consolidated Gas Company of New York City—prefacing his introduction with a few graceful remarks on Mr. Cortelyou's capacity as an organizer. The latter spoke on the "Commercial and Financial Aspects of the Gas Industry." He began with a brief historical summary, mainly from the commercial standpoint, of the introduction of gas in England, France, and the United States. Next he traced the increase in production, and coincident decrease in price, from a few millions of cubic feet at $10 per 1000 cubic feet in 1826 to 157,000 millions of cubic feet at an average price of 85 c. per 1000 cubic feet in 1908. In connection with the worth of gas securities, he stated that in the last decade an increase in gas sales of 100 per cent. was indicated, which compared to a population increase of 21 per cent. during the same period. He spoke of the value of salesmanship and of publicity as agencies for promoting gas sales; and in this connection noted the formation of the British Commercial Gas Association. He emphasized the necessity of creating a favourable public opinion, often requiring the uprooting of an inherited prejudice against gas companies, much of which is due to the "uncommercial methods" of earlier days before the coming of the watchword "service," which should be written large in the mind of every worker for a "public utility corporation." He touched on the importance of light to the

growth and efficient policing of communities. He then considered the relation of the modern gas company to the municipality, detailing their mutual obligations. From this he passed to some brief statements that municipal ownership in this country had always compared unfavourably with private ownership, and that wise regulation, not management, of the latter by commission was the end to be sought. In conclusion he said:

> This centenary celebration is a milestone in the progress of one of the world's greatest industries. These hundred years have given to mankind many of the most marvellous of its processes and of its inventions. In a gathering of this character, we draw upon the past for its history and its lessons. Knowing by these means of the character of the pioneers in the gas industry, and of many of their successors by more intimate association, I believe these men of the present are in a position to contribute much to the solution of problems that to-day confront the business community; and, furthermore, I believe they are alive to this opportunity for beneficent public service.
>
> In this time of industrial unrest, the business interests of the country should play a conspicuous and helpful part. Commercial honour is not a rarity; the ethics of trade are not mere memories of a glorious past in the life of the nation. Such generalizations are but the familiar stock-in-trade of the professional agitator or self-seeking politician. But business—big business and small business in all its manifold branches—owes its strength and progress and its permanency to that ordered liberty whose fostering care it can in no wise so well assure, and when assured repay, as by willing and complete obedience, not only to the law of the land but to those higher laws without an observance of which we shall fall far short of our ideals of the true commercial greatness of a mighty people.

An interesting incident occurred at this point. The Chairman asked all those present who had been engaged in the gas business for over thirty years to rise. About twenty did so. Among them was Mr. L. H. Davis, ninety years of age, who was a builder of gas-works prior to 1850.

The next speaker was Mr. Alfred E. Forstall, of New York City, Secretary to the Trustees Gas Educational Fund, whose subject was "The Technique of Gas Manufacture." He described the development of the knowledge of aëriform substances from Van Helmont to Winsor; ancient and modern methods of coal-gas manufacture and distribution; the introductions of bye-product ovens; the manufacture of water gas; the advantages of a combined coal-gas and water-gas plant; the manufacture of oil gas of low candle power; and the commercial failures of the attempt to supply a gas of low calorific value. Then followed a clear exposition of the principles that should govern "the destructive distillation of carbonaceous bodies for the production of gas for illuminating and heating purposes," and how far these principles are now applied in practice. He believes that "much remains still to be investigated, and there is no reason to doubt that the processes now employed will be improved as time goes on, and that the debt of humanity to the gas industry, accumulated in the first century of its existence, will be largely increased in the second."

At the conclusion of this lecture, a recess was taken, during which the lecturers and their hearers, to the number of about 300, were the guests of the United Gas Improvement Company at a well-appointed luncheon, served in the roof garden of a neighbouring hotel. It may be noted that the attendance was very gratifying, including many men of prominence in the industry.

The afternoon session was presided over by Mr. J. M. Dodge, a Vice-President of the Franklin Institute. He introduced Mr. Van Renssellaer Lansingh, of New York City, who spoke on "Gas as an Illuminant." The lecture covered the subject of lighting, both past and present. It treated of modern gas lighting under the division of flat-flame and mantle burners. It mentioned, as a drawback to the upright mantle burner, the fact that until recently only one size of mantle, and therefore one intensity of light, was available; also that gas companies still supply inferior burners and mantles to those consumers who will not pay the price of the efficient article. In contrast, the electric companies handle only good makes of lamps. The lecture touched on high-pressure distribution from the standpoint of street lighting, of the useful function of the heated combustion products in promoting ventilation, and of new methods of ignition—giving to gas-lighting systems a flexibility hitherto possessed solely by electricity. Two suggestions made to obtain improvement in gas lighting were:

> (1) Greater range in the size of the units to better meet the requirements of all classes of light, both in upright and inverted burners.
>
> (2) More reliable methods of commercially rating gas-lamps, so that, when specifications are drawn up by the illuminating engineer or the architect giving certain definite illumination requirements, he can be reasonably sure of obtaining exactly what he wishes.

The second lecture of the afternoon session, and the last on the programme, was "The Use of Gas for Heat and Power: The Testing of Gas," by Dr. Edward B. Rosa, of Washington (D.C.), Physicist of the National Bureau of Standards. He spoke briefly of the use for heat and power of coal gas, acetylene, natural gas, and producer gas, and described the conditions for good combustion. He then traced the development of gas for cooking, mentioning a stove in use in Philadelphia prior to 1860, whose boiling burner consisted "of a piece of ¾-inch pipe bent upwards within a sheet-iron truncated cone, containing a perforated baffle-plate of the same material. The upper end of the cone contained a fine wire screen covered with about ½-inch of fine gravel." He spoke of the instantaneous hot-water heater as having greatly augmented the use of gas-ranges. In this he hardly gives credit enough to the circulating water-heater of ordinary type, which, though requiring an appreciable time to heat water, is still the rule in most houses using gas-ranges, as the high price of the instantaneous heater precludes its widespread adoption. He touched on the use of gas for room heating and for industrial purposes, both low and high pressures, and on the development of the gas-engine.

Under "Testing of Gas," he described the important work being done by the Bureau of Standards. A careful study has been made of the subject of State and municipal regulations of quality, purity, and pressure; and a circular has been issued in the "hope that it may be of great value both to City and State officials and to the gas industry in the preparation and revision of rules and laws controlling the distribution and sale of illuminating gas." A second investigation is in progress in reference to testing gas for purity and lighting value. The resulting circular will be ready for publication within a year, and "will be much more comprehensive than the "Notification" of the Metropolitan Gas Referees, London. In this connection, the lecturer discussed in great detail the question of gross *versus* net heating value, and expressed his preference for the latter as being the only scientific method of ascertaining the calorific power of a gas, as it is "independent of the amount of water vapour entering the calorimeter with the incoming air current, or of the quantity of water vapour leaving with the products of combustion." He also called attention to the effect of variations of barometric pressure on unit quantity of gas—a variation which in one city amounted to a reduction of 17·7 per cent. in the mass delivered as compared with sea level (*i.e.*, normal) conditions. He realized that certain practical difficulties stood in the way of the immediate adoption of changes necessary to meet his views, and suggested that "a Committee of the American Gas Institute, working in co-operation with the Bureau of Standards, might give the matter careful study."

So much for the lecture programme. The other feature of the centenary requiring mention is the temporary loan exhibition of models, appliances, books, and pictures. This was thronged before, between, and after sessions, and was a source of pleasure and interest to all. It contained—to mention only a few of the most notable exhibits—the patent model of the Lowe water-gas apparatus, old gas-meters, many old types of regenerative and Welsbach lamps, the old gas-range mentioned by Dr. Rosa, records of slave labourers employed by the New Orleans Gaslight Company, views of old gas-works, and photographs of prominent gas men past and present. Among these was a photo of the late Sir George Livesey; for no celebration relating in any way to London gas affairs would have otherwise been complete.

Garcke's "Manual of Electrical Undertakings" for 1912-13.

We have received from the Electrical Press, Limited, a copy of this work, which has just been published. It is the sixteenth annual volume, and contains statistical and general information relating to about 3000 electrical undertakings, as compared with 200 in the first volume, issued in 1896. The contents are divided into seven sections, the first four containing a record of electric companies formed under the Joint-Stock Companies Acts and of electric undertakings belonging to local authorities in the United Kingdom, and those in the Colonies and the British Possessions. Comparative summaries, covering the financial results of electric lighting and traction undertakings, are given; and comprehensive statistics relating to all sections of the electrical industry have been brought up to date. Section V. is a "Directory of Officials;" and it contains upwards of 12,000 addresses, all of which have been recently checked. A valuable feature of the book is a list of members of the Electric Lighting and Tramway Committees, with their addresses. As in previous volumes, the particulars given have been obtained from official sources, and have been verified at the latest possible date by responsible officers of the undertakings concerned. There are several maps in the book; and accompanying it, is a large map showing the electric light, power, and traction undertakings in the United Kingdom. The volume (occupying 1800 pages) has been compiled under the direction of Mr. Emile Garcke, and is published at Nos. 37 and 38, Strand, W.C., at the price of 21s. net.

The Midland Junior Gas Association will hold a special general meeting at the City of Birmingham Technical School on Thursday of this week to consider the rules of the Association.

Southern District Association.—It has already been announced in the "JOURNAL" that the spring meeting of the Association will be held on the 15th inst., and that the members will visit the works of the Mitcham and Wimbledon Gas Company, of which the President (Mr. B. R. Green) is the General Manager. We learn from the Hon. Secretary (Mr. W. E. Price, of Hampton Wick) that the Directors have kindly undertaken to provide luncheon at the works; and that it has been arranged, on the conclusion of the visit, to drive to Hampton Court, and spend the remainder of the day on the Thames. For this purpose, a steam-launch has been engaged to convey the members down the river to Westminster Pier, which will be reached about seven o'clock.

STATISTICS OF GERMAN GAS-WORKS.*

THE statistics of which the last issue is now before us have been published annually for each year from 1879-80 onwards. But the number of works included has increased, with successive issues, from 45 in the first to 425 in the present issue. There has been the large increase of 129 in the number of works included in the volume under review, as compared with that for the year 1909-10. The gas-works dealt with are those under municipal ownership and control, with a few of those under private ownership. The number of privately-owned gas undertakings in Germany is comparatively small. The chief German works not owned by municipalities are those of the Imperial Continental Gas Association, the German Continental Gas Company, and the Thuringian Gas Company. Some particulars are given in regard to the two latter; but we do not notice that any of the Imperial Continental Association works are included.

The statistics in the present volume are very comprehensive. They correspond to some extent to the Board of Trade returns of gas undertakings in this country, but are not prepared by a Government Department, but by an editor, Herr Heidenreich, acting for the German Association of Gas and Water Engineers. The statistical information is divided into three sections, of which the first, in addition to giving general details, relates to the manufacture of gas. The name of the town with the ownership and number of the gas-works, and the population of the district of supply, is followed by a statement of the capital expenditure on the works, the number and description of retorts or carbonizing chambers, total gasholder capacity, total make of coal gas and of carburetted or uncarburetted water gas in the year, quantity of coal carbonized, quantity of coke and oil or benzol used for gas making, average make of gas per ton of coal, average consumption of coke and oil or benzol per 1000 cubic feet of water gas, average and maximum proportions of water gas to coal gas, and the gross calorific power of the gas distributed.

The towns of which the particulars are given are ranged in order of the annual output of gas—beginning with Berlin, which has the largest, even without the make of the works in that city owned by the Imperial Continental Gas Association, which are not included in the statistics. A few towns outside Germany are (for some not very obvious reason) included in the statistics—*e.g.*, Amsterdam, Copenhagen, Stockholm, Zürich, Bâle, Lausanne, Riga, Flensburg, Helsingfors, Lucerne, Pressburg and Debreczen. Hamburg has the next largest annual output of gas to Berlin, though it stands at only a little more than one-third of that of the latter city. Amsterdam comes third in point of output, and is followed by Dessau. But the Dessau figures evidently refer to the gas made at all the sixteen works of the German Continental Gas Company, only one of which works is in Dessau itself. Leipzig is the largest town included in the returns which makes no water gas. Water gas also is not made in Munich, Zürich, or Strasbourg. The returns of the make of coal gas per ton of coal are affected, in the case of works in which vertical retorts are used, by the inclusion as coal gas of the water gas produced in the retorts by steaming. Of the larger works which have no vertical retorts, the largest make per ton is attained at Dantzig—viz., 13,320 cubic feet per ton. In Berlin, the average proportion of water gas is 134 cubic feet to 1000 cubic feet of coal gas. At Amsterdam, the corresponding figure is 375. Other places using a comparatively large proportion of water gas are Nuremberg (290 cubic feet), Barmen (280 cubic feet), Heidelburg (250 cubic feet), Ludwigshafen (300 cubic feet), Graudenz (390 cubic feet), and Brieg (300 cubic feet). The gross calorific power in the twenty largest towns for which it is stated ranges from 5200 to 5750 calories per cubic metre at 0° C., 760 mm., and dry (545 to 622 B.Th.U. per cubic foot at 60° Fahr., 30 inches, and saturated).

The second section relates to bye-products and distribution. The total quantity of coke made is stated and apportioned between the consumption in the retort furnaces, the consumption on the works for other purposes, and the quantity available for sale. The amount of liquor made is given in terms of liquor of definite strength, or of the sulphate produced from it, and the yield of real ammonia or of sulphate per ton of coal is reported. The production of tar is stated in tons and in percentage by weight of the coal carbonized. The length of low-pressure mains is given; and where they exist, the length of high-pressure mains and the pressure maintained in them. The number of consumers, the number and sizes of meters, and the average consumptions per ordinary meter and per prepayment meter, are next given. The section concludes with the number and aggregate horse-power of the gas-engines. As compared with many English gas undertakings, the proportion of prepayment to ordinary meters is relatively small in the German towns, though in Copenhagen and other towns outside Germany included in the statistics the prepayment meters are in some cases in a majority. Of German towns, however, Königsberg stands apart as having nearly 20,000 prepayment meters to only 13,290 ordinary meters.

The third section gives the amount of gas consumed per annum, the increase or decrease over that of the preceding year, the consumption per annum per head of the population and per kilometre length of main. The maximum and minimum daily output and the maximum output per hour are stated. Then follows a statement of the proportion of gas sold for lighting and for other purposes by undertakings which give independent supplies for the different purposes. The number of street-lamps, with the description of burners, is next given, and the distance lighters employed. In some cases the numbers of distance lighters of different types are stated separately. The price of gas and particulars of differential rates, where they are maintained, are given in the last columns of this section.

The volume contains an index of places, and a short table in which the total number of works is classified into nine groups according to annual output. The work gives fuller particulars of German gas-works than are given in the Board of Trade returns for English gas undertakings; and it should prove valuable for comparative reference purposes.

* "Statistische Zusammenstellung der Betriebsergebnisse von 425 Gasanstaltsverwaltungen für das Jahr 1911 bez. 1910-1911 herausgegeben im Auftrage des Deutschen Vereins von Gas- und Wasserfachmännern." Bearbeitet von Direktor K. Heidenreich, Geschäftsführer, Berlin. Munich: R. Oldenbourg.

GAS LIGHTING AND PLANTS.

ARTICLES have appeared in recent numbers of "Wasser und Gas" by Herr P. W. Graszynski, of Karlshorst, near Berlin, dealing with plant life as affected by the air of living-rooms, and giving reasons why gas does not contribute to any ill-effects which may be observed.

The articles are written primarily from the botanist's and horticulturist's standpoint, with a view to showing why plants are susceptible to injury from the influences to which they are exposed in living-rooms, and which plants are least affected thereby. The author remarks that previous communications on the subject of the growth of plants in relation to gas lighting have mostly emanated from gas men, who have received more or less assistance from horticulturists. But no serious attempt to prove, from botanical reasons, that gas lighting can have nothing to do with the thriving or otherwise of plants in rooms, has hitherto been made.

The author proceeds to refer to the structure of a plant as shown by sections under the microscope. The cellular structure at different stages of growth is described; and the functions of the protoplasm, sap, and chlorophyll are explained. The chlorophyll is the green colouring matter of the leaves of plants, and the colours of blooms depend mostly on other liquid colouring matters. Passing on to the life of plants, their growth and development depend on the enlargement of existing cells and on the formation of new cells. The materials requisite therefor are derived from the atmosphere and the soil. The materials taken by the roots from the soil are not of importance for the question now under consideration. The leaves of plants absorb, through pores in their underside, carbonic acid from the air, and the cells containing chlorophyll, under the action of sunlight and the protoplasm, decompose the carbonic acid, producing the carbon which is requisite for the formation of structural cells. The oxygen liberated from the carbonic acid is discharged from the leaves. Many conversions of material proceed in the plants; insoluble substances being converted into soluble, and then reconverted. Inorganic substances are ultimately converted into organic compounds. But the decomposition of the carbonic acid of the air depends entirely on the cells containing chlorophyll. Plants which do not contain any chlorophyll—such as fungi and a number of parasites—derive their sustenance from the organic substance of other plants or animal matter. On the other hand, the decomposition of the atmospheric carbonic acid occurs only under the influence of sunlight. It takes place in daytime, is restricted to the green parts, and is interrupted in the dark. All parts of the plants night and day take up oxygen from the air and form carbonic acid, which, with water in the daytime, is converted in the chlorophyll cells into starch. The carbonic acid, therefore, participates in a cycle as follows: It is given off in breathing by every animal and plant, the green parts of the plants decompose it and return the oxygen to the air, which is again worked up by animals and plants and exhaled as carbonic acid. The breathing of plants is of the greatest importance for the existence of all life, for in an atmosphere free from oxygen there can be no germination or growth.

Clearly, therefore, no plants can live in an atmosphere of pure coal gas, but neither can any other form of life, because the absence of oxygen makes breathing impossible. Practically the only case to be considered in regard to the effect of gas on plants is that of the atmosphere of rooms in which men are living. Many cases are well known to the general public, as well as to gas engineers, of rooms lighted with gas in which plants thrive admirably. In towns, florists' shops sometimes have electric lighting, but for the most part gas lighting. They certainly would not adopt, or continue to use, the latter if their plants suffered in any way therefrom. In the well-known Friedrichstrasse in Berlin there are twenty-nine florists' shops, and twenty-one of these are lighted by gas. At the Botanical Institute of Berlin University, incandescent gas lighting has been used for many years in the microscopical room, in which plants are kept for a long time. Such examples indicate that other causes must be sought for in cases in which plant life suffers in rooms.

It may be presupposed that the gas service-pipes and connections are sound, because the smell of gas, even in the smallest quantities, would prevent escapes being tolerated in inhabited

rooms. The suggestion that carbonic oxide might diffuse through the gas-pipes and injure plants is also quite untenable, because it would be at least as deadly to human beings as to plants. In regard to the products of combustion from the purified gas which at the present time is distributed from all gas-works, they are water and carbonic acid, both of which have been shown to be utilized by plants. If the sulphuretted hydrogen and cyanogen compounds were left in the gas, the products would be injurious to plants. The sulphur dioxide formed by the combustion of the former would bleach the colours. Since, however, purifying plant for the removal of sulphur and cyanogen compounds exists in even the smallest gas-works, and since florists constantly use gas for lighting purposes, the question of injurious effect from the products of combustion of sulphuretted hydrogen and cyanogen compounds may be entirely disregarded. The purification is effected for the sake of the health of the occupants of the rooms, and it would be splitting hairs to consider the possibility of slight traces of impurities which are not injurious to human beings affecting plants. Before passing on to consider the special causes which affect plants, the author quotes from certain communications which have already appeared on the subject.

The first of these is a report which appeared in the "Gartenlaube" in 1869, in which a record is given of experiments made by Dr. Poselger, of Berlin, on the effect of escapes of gas in the soil on the vitality of young trees of eight different kinds planted in it. The trees were planted in a long box filled with earth through which a pipe with small perforations passed. After the trees had become established by a year's growth in the box, one end of the pipe was connected to the gas supply and the other end closed. The gas was turned on for three hours daily for forty days in July and August; and notwithstanding the escape of gas from the perforations through the soil, the trees continued to flourish, and were in good condition a year later. The article goes on to point out that no injury may be feared to the growth of trees in town promenades, &c., through the escape of gas into the soil, provided the roots of the trees have free play. The construction of a walled pit to prevent gas entering the soil in which the tree is growing is more likely to be injurious, owing to the difficulty which the tree will experience in such circumstances in finding sufficient moisture in times of drought.

The second case was reported from Christiania, where a number of plants such as are used for room decoration were taken direct from the glass-houses of a market gardener and kept for two years in a living-room on the gas-works. The plants were placed in windows facing the works, and they continued to bloom and flourish throughout the time. The report, however, states that foliage plants in particular flourished exceedingly, whereas plants grown for their blooms, such as roses, fuchsias, and cloves, did not flourish so well; while bulbs gave very good results.

The third report quoted is one by Mr. L. C. Corbett in the "Gardener's Chronicle." He grew lettuce, radishes, spinach, tomatoes, beetroot, and young cabbage plants under glass from 1895 to 1899, with the object of ascertaining the effect on them of direct gas light. He used eight Welsbach burners uniformly distributed for lighting, and a large number of plants. The plants grown in this artificial light were larger, heavier, and finer, and grew more rapidly than those grown in ordinary conditions at the same time. Details of the increased weight of the different plants under the influence of gas lighting are quoted. The experiments are suggestive, in that they raise the question whether gas light does not cause the chlorophyll cells to decompose carbonic acid and form fresh cells just as sunlight does. It would appear from Corbett's experiments that this is the case; but it is not clear from the report whether Corbett exposed his plants to gas lighting during the day as well as the night. The increased growth was more perceptible in the leaves than in the tubers and roots. The experiments, however, clearly established that gas lighting was not injurious to plants.

The fourth report quoted is one in regard to a garden adjoining the gasholder at the Harrow Gas-Works. Even ferns and fuchsias developed perfect leaves and showed no ill-effects from their vicinity to the gas-works. This is a common experience on many gas-works at the present day. The last report quoted is from Russia, and is to the effect that florists who have introduced gas lighting into their stores have been unable to trace any injury to blooms and plants therefrom.

The reasons why plants do not flourish in rooms must be sought in bad air, wrong temperature, humidity, or improper conditions of light and soil. Generally, the plants are subjected to conditions to which they would not be naturally exposed. The difficulty of keeping plants in good condition in dwelling-rooms is especially great in the case of flowering plants. Blooms have thin-walled (parenchymatous) cells, as compared with the thick-walled (prosenchymatous) cells of foliage. The thin-walled cells are much more sensitive to external influences than the thick-walled cells. For instance, if a flowering plant, such as a cyclamen, is bought, it experiences a change of temperature from some 39° to 46° Fahr. in the greenhouse or the florist's shop, to one of about 64° Fahr. in the dwelling-room, where, moreover, the air is for the most part very dry. The plant suffers from the dryness of the air and the consequent rapid drying-out of the soil however frequently it may be watered. The same experience of rapid fading of blooms is experienced in the case of cut flowers, which last much longer in the florist's shop than in warm dwelling-rooms. The thicker walls of the cells of foliage plants enable them to withstand the temperature of the rooms, with its consequent ill-effects, for a longer period. For the most part it may be said that plants indoors suffer injury from too high temperatures. Moreover, they lack the movement of the air and the sprinkling of the leaves, and especially light; and for many kinds direct sunlight is absolutely essential. Among the plants which are least susceptible to the injurious influences of dwelling-rooms are bulbs; but after the leaves of the latter have developed from the store of nutriment in the bulb, there is required for the development of the blooms a supply of fresh material from the air. This is not readily obtainable in dwelling-rooms, and consequently they are apt to fade and die off rapidly. The chief source of injury to roses, fuchsias, cloves, and similar flowering plants is the warm and dry air of the room. There is a sufficiency of carbonic acid in the air, but the green cells are unable to decompose it and assimilate the carbon in the absence of light.

Regarding the question from all points of view, it is necessary that plants for rooms should be rightly selected and then properly treated. If the rooms are maintained at a temperature of upwards of 64° Fahr., vigorous foliage plants should be preferred. For rooms maintained at a more moderate temperature, all the plants which are ordinarily obtainable from the florist's may be safely adopted in the rooms. The causes why plants in rooms do not flourish have been shown to be independent of gas lighting. It obviously saves trouble to ascribe the blame to gas lighting if plants do not flourish, but the many thousands of florists' shops in which gas is used for lighting show that this is an unjustifiable position. The author considers that he has demonstrated that gas is not injurious to plants, but, on the other hand, is in many respects directly serviceable.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

Visit to the Works of Messrs. Stewarts and Lloyds.

The Eastern District of this Association last Saturday visited Messrs. Stewarts and Lloyds' Imperial Tube-Works at Coatbridge. The visitors, numbering about thirty, were received by Mr. R. Smith, of the Clyde Works, and by Mr. Robert Little, the Assistant-Manager at the Imperial works. The party, after being divided into groups, were conducted over the works by these gentlemen and their assistants.

The tube shop, with its modern appliances for the efficient and economical production of all sizes and shapes of steel pipes, demanded close attention. This spacious building (600 feet square) houses some 600 workmen, who turn out, on an average, 2000 tons of material every month. Here were to be seen all the various processes in pipe manufacture—the scarfing, or turning the plain sheet of steel into a rough circle with bevelled edges, the welding furnaces, the rolling and finishing machines; and the staving machines for making long sleeve joints. What perhaps struck the visitor most was the vast number of different joints, all designed to do exactly the same work. It is evident there is no uniformity of opinion among engineers as to which is the best type. The great bulk of the pipes are coated with Dr. Angus Smith's preservative solution. The pipe and solution are heated to a common temperature by means of one furnace, and then the pipes are dipped in the solution tanks. It was interesting to the members to note that the welding furnaces were heated by means of furnace gas, manufactured in ten huge generators. An opportunity was also given of viewing the Climax Tool-Works, immediately adjoining the tube-works, and controlled by the same Company.

At the conclusion of the visit, the members were entertained at tea in the Central Office. Before parting, Mr. John R. Moyes, the President of the Association, proposed a vote of thanks to the Directors of Messrs. Stewarts and Lloyds, to Mr. Smith, and the various assistants for their kindness to them.

This concluded a very interesting and instructive afternoon. The only glimmer of a shadow cast over the visit was the comparatively small number of members present.

We learn from the Hon. Secretary (Mr. Harold E. Copp, of West Bromwich) that the spring meeting of the Midland Association of Gas Managers will be held at Oldbury on the 30th inst.

Mr. Harry S. While, who for more than a quarter-of-a-century has been associated with his father, Mr. Samuel While, in business as contracting gas engineers, is in this connection personally known to a number of our readers. They may not be aware, however, that he has always made a hobby of clay modelling, and has studied under Mr. Alfred Drury, A.R.A., and Mr. Albert Toft with so much benefit that he has taken a bronze medal and various book prizes in the South Kensington National Competition. These sucesses have, we learn, been followed by the acceptance for the Royal Academy Exhibition, which opened yesterday, of two statuettes —one called "A Greek Runner" (cast in bronze by the "*cire perdue*" process), and the other a female figure called "Félicité." Mrs. While is also exhibiting a portrait bust this year. Mr. While's friends in the gas industry whose interest in art is sufficiently strong to take them to Burlington House may therefore be pleased to learn that they will have an opportunity of seeing there some of his work of a far different character from that with which his firm's name is associated.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting in Newcastle-on-Tyne.

The Seventieth Half-Yearly General Meeting of this Association was held on Saturday, in the Lecture Theatre of the Institute of Mining and Mechanical Engineers, Newcastle-on-Tyne. The PRESIDENT (Mr. Henry Tobey, of Malton) occupied the chair; and there was a large attendance—the visitors including Mr. R. G. Shadbolt, the President of the Institution of Gas Engineers; Mr. Samuel Glover, the President of the Manchester District Institution of Gas Engineers; and Mr. Jacques Abady, of London.

THE ACCOUNTS.

The PRESIDENT, having briefly welcomed the members, alluded to the statement of accounts, which he said was satisfactory; and he moved its confirmation.

Mr. C. H. ARMSTRONG (Wallsend) seconded the motion; and it was carried.

NEW MEMBER AND ASSOCIATE.

Mr. John Young (Hull) was elected a member of the Association; and Mr. Ermin A. Leask (Sunderland), an associate.

THE INSTITUTION BENEVOLENT FUND.

The HON. SECRETARY (Mr. Herbert Lees, of Hexham) moved a recommendation of the Committee that the Association contribute five guineas to the Benevolent Fund of the Institution of Gas Engineers. He said he was told that there was some misconception as to the working of the fund; but this, he thought, could only arise in quarters where there was lack of information. He pointed out that the Hon. Secretary of each of the District Associations was a member of the Management Committee of the fund; and therefore, if they had confidence in their Secretaries, all cases would be duly attended to. Moreover, Mr. Thomas Bower was a member of the Committee; and they knew he would watch the interests of the district as well as of the community of members generally. They were in this fortunate position that, so far as he knew, no member of the North of England Association had required to come on the fund; but if relief was needed in any case, all that was necessary was to communicate with the Secretary, and due inquiries would be instituted. If circumstances then warranted it, a contribution for relief would be made.

Mr. T. HARDIE (Gateshead) seconded the proposal; and it was agreed to.

DIPLOMA FOR PRESIDENTS.

The HON. SECRETARY submitted a proposed parchment diploma which it was recommended should be presented to all Past-Presidents and others who succeeded to the chair, as a memento of their year of office. The cost was 5s. 6d. per copy, the frame being extra. The expense of purchasing 50 copies for past and future Presidents would be about £15. The centre design of the diploma showed the arms of the county borough of Newcastle-on-Tyne, and at the corners were those of the counties of Yorkshire, Westmorland, Durham, Cumberland, and Northumberland, which were the counties covered by the Association. At the top of the diploma was a representation of the sun, indicative of light, power, and heat; and under this symbol was a Latin motto which, being interpreted, meant "We shine in the North." [Laughter.] This seemed to be entirely proper. [Laughter.] He felt that, with little flattery to themselves, they should not be unwilling to adopt the Committee's recommendation. It might inspire ambition in some of the younger members to become the happy possessor of one of the parchments.

Mr. W. HARDIE (North Shields), in seconding the recommendation, said the diplomas would help to remind the members of Past-Presidents whose names they were apt to forget a few years after they had vacated the chair. He quite agreed with the suggestion that there should be something tangible for the President at the close of his year of office.

The HON. SECRETARY, in answer to a member, said he had omitted to mention the text which it was intended to insert on the parchment. It would be taken from the rules of the Association, and would set forth the objects of their organization.

Mr. G. LAMB (Heaton, Newcastle) said that, as an aspiring President (laughter), he had very great pleasure in supporting the resolution. The diploma represented something out of the ordinary; and, in adopting it, the Association were stepping out of the otherwise lonely course they had pursued in reference to those who had passed the chair.

The proposal was agreed to.

LIGHT AND COMPETITION.

Mr. JACQUES ABADY (London) then delivered a lecture on this subject, and it will be found on p. 359.

The PRESIDENT said they would agree that the lecture to which they had listened had been most interesting and instructive, and, at the same time, inspiriting and encouraging. He hoped that they had all benefited by the discourse, and that they had taken in, and would follow up, to their advantage, some of the suggestions made. Mr. Abady had told them many things with regard to electric lighting; and his investigations should encourage them, and inspire them to hold their own against electric competition. He called upon Mr. Nelson to read his paper.

CARBONIZING PLANT AT THE EAST HULL GAS-WORKS.

Mr. R. NELSON (East Hull) read a paper entitled "Extensions to the Carbonizing Plant at East Hull, with Notes on Working Results." The paper, the discussion on which was adjourned, will be found on p. 362.

VOTES OF THANKS.

Mr. ROBERT WATSON (Doncaster) moved a vote of thanks to Mr. Abady for his lecture, and to Mr. Nelson for his paper. Most of them knew Mr. Abady personally, and certainly all of them knew him by repute. He had been at their meetings previously, and had helped considerably in giving them information so far as photometric subjects were concerned. That day he had placed them under a debt of gratitude, because he had given them information in connection with light and competition. Mr. Abady had brought out points which they should lay to heart in meeting competition with electric lighting. He had stated in dealing with competition, in regard to costs and candle powers, a good many things which they had neglected as important factors. They did not wish to disparage the fact that advances had been made in electric lighting. The competition was likely to be more severe; and all the information they could possibly get from gentlemen who had the ability to give that knowledge would be exceedingly useful to them. The table which Mr. Abady had placed on the board, however, was one which was surprising to some who might have accepted the electrician's figures of 1·1 watts per candle for metallic filament lamps. It was only necessary by ocular observation to know that metallic filament lamps did deteriorate; and now that they had conclusive evidence that this was the fact, they could face their competitors with greater confidence. He was glad that Mr. Abady had dealt with the physical quality of illumination. They knew that he was referring to photometric tests; but of the special points that he advanced in connection with the amount of light given by the green and yellow rays in the spectrum, the relative luminosity compared with other light waves was particularly interesting, inasmuch as they had an incandescent mantle that furnished a large proportion of this particular wave light. He was not quite sure whether it was possible to increase the amount of light by quickening-up the red rays at the end of the spectrum. It was probably well known that the amount of heat actually converted into light was exceedingly small—somewhere in the region of 5 to 10 per cent.; and it so happened that of their advantages they only utilized a very small proportion of the heat in the spectrum, whereas the metallic filament and other lamps were rather more efficient in this respect. Therefore, if they could quicken-up these rays, they had a great pull in increase of light from the red side of the spectrum. They all had been intensely interested in the facts which Mr. Abady had brought forward; and they were greatly indebted to him. Personally, he hoped they would have many such lectures as the one they had listened to, not merely in the Association but in the gas industry at large. He was not so well versed, excepting in theory, in vertical retort installations, and could not, therefore, refer so particularly to Mr. Nelson's installation at East Hull. About a month ago, however, he had a hasty glimpse of the installation at Hull; and what he had seen of it had convinced him that Mr. Nelson had really excellent and well-constructed works. He hoped that Mr. Nelson would be able to continue the good results indicated in his paper. It was rather fortunate that the discussion was not being taken that day, because he considered, in connection with an installation of this description, which necessitated very heavy capital expenditure, the facts that were given should be well digested. The majority of gas engineers in the country were still working with the horizontal retort system; and the difficulty with them was to scrap these and put down vertical retorts unless they had figures which were absolutely authenticated. Therefore, those who had been good enough to put before them data as to their vertical retort installations were doing great service in giving them all the details possible. At the same time, it was well for those who took part in such discussions that they should be perfectly certain that the figures advanced were correct; otherwise many in the country might be misled.

Mr. NORMAN S. COX (Sunderland) seconded the votes of thanks, and said their hearts were full of gratitude for the excellent contributions which had been placed before them by Mr. Abady and Mr. Nelson.

Mr. R. G. SHADBOLT supported the motion, and said that, as a matter of fact, the resolution was not required, as both the lecture and the paper demanded recognition. He appreciated both for the authoritative information which they respectively contained, and for the hard work, on behalf of the Association, which the lecture and the paper, in their preparation, had entailed. Mr. Abady had pointed out the advisability of their making it their main object to produce a simpler gas; and, immediately following that, Mr. Nelson gave them an analysis of a gas somewhat approaching to the conditions laid down by Mr. Abady. This was certainly a step in the right direction; and he thought that the

majority of those present, and gas engineers generally, would agree that it was the way in which they should develop. There they had information, immediately from the practical side of view, of what was required from the theoretical side. Mr. Abady had taken them to task to some extent, and rightly so, in regard to the question of comparative costs and illuminating power tests as the basis of their comparison, and standing or falling thereby. There was no doubt they had been too prone in the past to wait until an attack was made upon them before they responded—knowing and feeling that they had a very good case, but thinking that it was not necessary to parade it, or to state it. This time had gone by. They had a good case; but unless they took up the necessary line of informing their customers and the public as to what their commodity could achieve, judgment would go against them by default. This was a simple commercial problem which they were often compelled to meet. He remembered some years ago going into the case with a gas engineer, who had under his control an electric light undertaking, in the days of the flat-flame burner, and when electricity was 1d. per unit; and they came to the conclusion that it was equivalent to gas at 1s. per 1000 cubic feet. As the carbon filament lamps improved, these comparative figures were as 1d. to 10d. If they took Mr. Abady's example on the 15 candles per cubic foot basis, they found the comparison on similar lines was as 1d. to 2s.—one in twenty-four. So that, though it was necessary that they should go more thoroughly into the finer arguments and the finer lines of their business, still the fact did remain that they had a good—indeed, an improving—case. Both lights had improved since the time that he had alluded to; but, comparing them, they had a still greater advantage than previously. Progress, however, was going on very rapidly indeed; and, in this connection, he would like to call their attention to the work that was being done by the Illuminating Engineering Society in London. He thought that it would be a good thing for the industry generally, and certainly for the public, if the operations of the Society could be extended to the provincial centres, because the study of illuminating effects reached by the electrical and gas engineers acting together, quite apart from the cost of the source and the medium, was very interesting and instructive, and, if they looked at it from the consumer's point of view, very necessary. To be able to treat of illumination as illumination, apart from the source from which it was obtained, and apart from the cost, was a study which, taken as an industry, was something they had neglected very much. Having arrived at the conclusion that it was essential that they should devote a little more time and attention to luminosity, illumination, and illuminating effects, he thought if they could follow Mr. Abady into the analysis of the light sources they would find a great field for investigation. They would find, as a result of these investigations, a greatly increasing service to the community generally, which would be appreciated by them, and in due time could not but reflect upon the success of the industry they had so much at heart.

Mr. Samuel Glover (St. Helens) supported the motion, and said his pleasure in visiting the North of England Association had been considerably increased by having the advantage of listening to Mr. Abady on a subject upon which he was so capable of speaking with authority. Mr. Abady, if he did not already know it, might go away from the meeting feeling that he had helped to establish for himself—and, he hoped, for their industry—a fair-minded method of looking at these things, which was going to turn the assertions made into facts established. Mr. Abady's fair-minded way of dealing with the question made the assertions he submitted acceptable, not only to themselves, but to others with whom they had to compete in selling light to the communities they tried to serve. He could not help wondering, however, why Mr. Abady fixed the price of current at 2d., as in many districts gas engineers had to face a price very much lower than this. Therefore these arguments had to be applied in different relationships, according to the prices at which the current was supplied. It might be within their knowledge that they had an unfair competition to meet in the municipal communities who owned electric light and gas works. The electricity supply committees seemed to be at present the "spoilt child" of municipal communities. He was afraid that, like other people who marred and spoilt the beauty of their children by being too lenient, they were storing up for themselves a day of reckoning which was accumulating with terrible force at the present time. They would be no longer allowed to go on marring and spoiling the "baby," which so much had been done to spoil at the expense of the other members of the family, because it happened to be the youngest one of the parents. In many municipal communities, where gas was already laid on and doing its work of supplying light, heat, and power at commercially sound prices, money was being spent on what appeared to some people useless cables to furnish electricity at a non-paying rate; and the gas department had to suffer competition of this sort, which was commercially unsound, owing to the fact that the electricity generating works could not undertake to supply all current at the price they did, if they paid their way and maintained their works and their capital account in the same manner in which gas departments had been taught to do and persisted in doing. He was pleased the lecturer emphasized the naturalness of the light obtained from the incandescent gas-mantle. He was quite sure the lecturer did well to lay stress upon this, and enable the members to emphasize it when they were valuing the light they supplied, and the importance of the large illuminated surface of a gas-mantle as compared with the small intensely illuminated surface of metallic filament and other lamps. He was afraid the work that had to be done by the aid of electric lights was being done at the sacrifice of human eyesight at a terrible rate—a rate which was much greater than was being realized. They thanked Mr. Abady also for the suggestiveness of his idea of needing to supply gas at higher pressure at the point of juncture in the mixing chamber of the incandescent burner. The subject of ventilation on which he laid stress was very useful, as was also the question of burners. As a matter of fact, they at this moment were suffering from absence of movement of the atmosphere. It had been lately proved that mere movement of the same atmosphere was of some advantage. To put it somewhat crudely, they were that afternoon sitting in an atmosphere that was not moved, either by gas heat or by circulation. Too often and too seriously, in rooms in which communities existed for hours together, where the source of light was (say) electrical, in rooms constructed by modern architects and on modern, though not intelligent, lines, they were not, as he had said, properly ventilated. In regard to Mr. Nelson's paper, they all suffered from the disadvantage of not having seen the installation described. Had they been able to discuss the paper that day, they might have asked Mr. Nelson, as he gave them the temperature of the retorts when not working, what was the temperature during the working period—especially after the charge had been dumped into the retort while it was at the temperature which he had given in his paper. They might desire, also, to ask him how it would be, with his treble-feeding arrangement, to feed only one or two, and not three, retorts, which he ran abreast and drove with the same reins. There might come a time, after Mr. Nelson had had longer than a nine weeks' experience, when he might require to do this; and it would be interesting to know how he would do it. The question of capital expenditure always came up when anybody read a paper like Mr. Nelson's—as if Mr. Nelson, or anybody else, wanted to teach gas engineers to scrap all that they had got on their works and go in for something new, merely because it was new. He was sure it was not Mr. Nelson's desire to advocate anything of the sort. The capital account was always mentioned as a kind of bugbear when this subject came up. He was at a meeting where the capital cost of a certain plant was initially higher, and a gas engineer who sat behind him said, "That is enough, then"—as if this was the only point of view to be considered. Surely, in addition to considering the initial capital cost, the work to be done by the instrument bought had to be taken into consideration.

The votes of thanks were very cordially passed, and acknowledged by Mr. Abady and Mr. Nelson.

Election of Office Bearers.

The Scrutineer's report on the election of officers was presented by the Hon. Secretary; the office-bearers being as follows:

President.—Mr. Charles Henry Armstrong, of Wallsend.
Vice-President.—Mr. E. F. Hooper, of Sunderland.
Auditor.—Mr. W. Garbutt, of Newcastle.
Hon. Secretary.—Mr. Herbert Lees, of Hexham.
Members of Committee.—Mr. G. S. Sayner, of Harrogate, and Mr. W. Cowley, of Spennymoor.

A telegram had been received from Mr. Hooper expressing regret that circumstances had arisen which prevented his attendance at the meeting.

Votes of Thanks.

Mr. G. S. Sayner moved a vote of thanks to the retiring President, the Committee, and the Hon. Secretary for the able manner in which the business of the Association had been conducted in the past year.

Mr. T. H. Duxbury (South Shields) seconded the proposition; and it was heartily carried.

The President, in returning thanks, expressed his indebtedness to the members for the support they had given him during his year of office. With the assistance of a very helpful Committee and an indefatigable Secretary, nobody need hesitate, he said, to take up the position of President.

Mr. Lees also expressed his thanks for the continued support he had received, and said he felt that he had the friendship of every member of the Association.

Mr. C. H. Armstrong tendered his sincere thanks for the honour which the members had done him in electing him President for the ensuing year. He extended to them a hearty invitation to hold the October meeting at Wallsend. Wallsend, he had heard it suggested, was merely the back door of Newcastle. This, however, was quite an erroneous idea. It was a thriving borough—famous, as they knew, for its coal and its shipbuilding and engineering. The fastest ship that ever went across the Atlantic—the *Mauretania*—was built at Wallsend.

The Institute of Mining and Mechanical Engineers were thanked for the use of the lecture theatre; and this ended the business meeting.

The Luncheon.

The members of the Association subsequently lunched together at the County Hotel—the retiring President, Mr. Tobey, being in the chair. After the loyal toast had been honoured,

Mr. Jacques Abady, in a bright little speech, proposed the North of England Gas Managers' Association, which, he said, was formed in 1877 and had done excellent work.

The President replied, and said he had been a member of the

Association almost from the beginning. The lecture and the paper they had heard that day were useful to all managers, large or small. The North of England Association was one of the largest Associations; sharing that honour with the Manchester and the Southern Associations.

Mr. F. P. Tarratt (Darlington) proposed "Kindred Associations."

Mr. R. G. Shadbolt responded, and said that they in the gas industry should, through their organizations, advance their line of view, and make their position clearer, and not hide their light under a bushel. When they remembered what was being done by the British Commercial Gas Association, the Institution of Gas Engineers, the District Associations, and the commercial branches, he thought they might safely claim that the members of their family never were so active as they were at the present time, never were they imbued with greater unanimity in advancing the cause they had so much at heart, and which never before promised to result in so much real benefit to the industry and to the great public on whom they relied and whom they served.

Songs were sung at intervals.

LIGHT AND COMPETITION.

By JACQUES ABADY.

[A Lecture delivered to the North of England Gas Managers' Association, May 4.]

Since I am here by your kind invitation, conveyed through your indefatigable and justly popular Secretary, Mr. Herbert Lees, I feel that no apology is needed for my presence, but rather that a word of thanks is due to you for the compliment to me which your invitation implies. This word of thanks, I assure you, is very readily given, and the compliment sincerely appreciated.

As the matter upon which I am to address you is one which you chose yourselves, I also feel that I am exonerated from any apology for having to deal with a subject which is so well-worn, and upon which I freely confess it is exceedingly difficult to say anything new. There is, however, a good deal of virtue in a repetition of the old—particularly as in the rough-and-tumble of modern life one cannot always keep stored in one's mind the fundamental rules and formulæ which are really so important, and which are so often on this account lost sight of.

The Testing of Gas.

Now, it was in April, 1904—just eight years ago—that I last addressed you. The topic then chosen was "Photometry." This subject, like that of "Light," presents various aspects; and some of you may recollect that the particular aspect I selected on that occasion was to devote myself to an exposition of the rules governing the photometric valuation of gas, or, in other words, the testing of gas for "candle power" or "quality." I tried to show, by the familar process of giving examples of the inconsistencies then existing, how absurd and unjust was the method at that time in use; and I think the examples presented were a veritable *reductio ad absurdum*. Whether the exposition of the then prevailing absurdities had any influence on subsequent events, I do not know; but this I do know, that Mr. Charles Carpenter, by his ingenuity, persistency, and influence, was able to father the adoption of a system of burning gas when tested for candle power, the basis of which was the principle that I and others had consistently advocated—*i.e.*, the proper oxygenation of the flame, whatever the quality of the gas.

To put it in another way, when I last spoke to you gas was tested in the old argand burner at the rate of 5 cubic feet an hour, and in various extraordinary special burners. Now, on the other hand, practically all gas is tested in the No. 2 "Metropolitan" argand burner. Of course, there may be isolated cases where old contracts and Acts of Parliament keep one to the ancient method; but I think this number is becoming less and less every day. The industry which you represent has thus been freed to a very great extent from shackles which, like all shackles, were unpleasant; and you stand to-day with a very different outlook in the matter of testing and the quality of your manufacture than that which you had in 1904.

That the public has benefited very greatly from the better conditions governing the manufacture and distribution of a more stable product, is undoubted; but whether the capacity of production has reached its maximum, is a point which I very much doubt. The world, however, has not stood still. The progress which you have been able to make in better production, in larger makes per ton, and in the distribution of a more stable product, has been accompanied by progress in methods for utilizing the gas thus made. And here, again, is a field which I believe has only just been explored along its borders. Side by side with the progress which the gas industry has made, there have taken place great strides in the same direction in the sister industry, electricity. More effective machines for manufacturing current have been produced, in which the capital cost bears a smaller ratio than hitherto to the total cost. New forms for the primary production of power have been developed—such as oil-engines—and new lamps for converting electrical energy into light have been invented, and have come on the market. The metallic filament lamps were scarcely heard of in 1904. The flame arc lamps were only in their infancy. Yet at the present day the two sources of competitive light against which it is your duty—and, I have no doubt, your pleasure—to battle are these self-same metallic filament lamps and flame arcs.

Competition.

Now, gentlemen, I can state quite frankly that, in selecting for my subject the point of view of competition, I feel that I am on very delicate ground; but I believe that, as this is a lecture, and not a paper or technical communication, you will not think me egotistical if I endeavour to stimulate thought upon lines which I conceive may possibly be beneficial to your industry.

What is competition, and how should it be met? It seems to me that one can lay down two propositions—

(1) What are the strong and the weak points of your own and the electrical engineers' position; and do you both state your cases fairly?

(2) What are the possibilities of improving your own and the electrical engineers' position?

The first proposition is a very simple one; and it should be a mere statement of fact. But, for all that, I think it covers a multitude of sins.

Now, if we analyze the two sources of illumination which are in competition, we are, I think, forced to consider them from two points of view—firstly, price; and, secondly, quality and general suitability for giving light to human beings.

The Question of Price.

With respect to price, I do not feel able, in the limits of this lecture, to make comparisons of every kind of gas and electric light. It will suffice for my purpose to make assumptions, and to build up comparisons upon these assumptions. It must not, however, be taken that the assumptions are founded on fancy. They are based on facts within the limits of my own experience. I propose to compare low-pressure gas lighting with electricity consumed at service voltage in metallic filament lamps.

It is a fair assumption that, from every cubic foot of gas consumed in an inverted incandescent burner one obtains a duty within the limits of 15 to 25 candles, according to the quality of the gas and the pressure at which it is distributed. It is also a fair assumption that from a metallic filament lamp one can obtain a duty of 1 candle for 1·59 watts. Both these figures are mean horizontal candle power. If I were to reduce them to mean spherical, the figure for reduction would be about the same in both cases. If I were to reduce them to mean lower hemispherical, the figure for reduction would be in favour of gas, because the amount of light distributed in the lower hemisphere from an inverted burner approximates more nearly to the horizontal candle power than is the case with a metallic filament lamp. You will therefore see that the comparison is on a basis which favours electric lighting.

Before I draw your attention to comparative costs, I should like to make a point, which falls within my first proposition, as to whether the cases of the gas maker and the electrician are stated fairly. The point is, as you will observe, I have taken 1·59 watts as the amount required for the production of a candle; whereas statements made by electricians place the wattage lower and the duty higher. It would materially affect the resultant comparison if one were to credit electricity with more than it can do in providing light through the medium of metallic filament lamps; and as one who is impartial in this matter, I think I might draw your attention to the optimistic nature of the stated electrical results. If you could get an electrical manufacturer's list, and compare the stated candle power with the stated watts, you would find you would get 1 candle for from 1·1 to 1·25 watts. This is not so; and I think the mistake arises, firstly, from the natural desire to make the most of one's case; and, secondly, from the fact that most metallic filament lamps have their genesis in Germany, where the candle power is the Hefner, which is only 90 per cent. of an English candle power. Notwithstanding this fact, and that the lamps had their genesis in Germany and have made the inevitable exodus in coming to England, the same candle power figures are set out in the English lists, whereas they should, of course, be reduced on this account by 10 per cent. The next reason is that a metallic filament lamp, when first put under test, gives a very much better light for a few hours than that which it yields after burning for (say) 70 or 100 hours; and from tests I have made on a number of lamps, bought from makers, with a stated current consumption and a stated candle power, I have found the following results:—

Lamps sold as										
16	c.p.	20	watts	gave	13·2	c.p.	and	took	24	watts.
16	,,	24	,,	,,	16·9	,,	,,	,,	30	,,
25	,,	32	,,	,,	22	,,	,,	,,	38	,,
25	,,	32	,,	,,	20	,,	,,	,,	35	,,
32	,,	40	,,	,,	26·5	,,	,,	,,	41	,,
50	,,	63	,,	,,	49	,,	,,	,,	72	,,
50	,,	55	,,	,,	38	,,	,,	,,	54	,,
50	,,	55	,,	,,	41·5	,,	,,	,,	60	,,
100	,,	100	,,	,,	69	,,	,,	,,	103	,,
100	,,	100	,,	,,	70	,,	,,	,,	105	,,

The maximum duty of these lamps is 1·42 watts per candle.
,, minimum ,, ,, ,, 1·81 ,, ,,
,, mean ,, ,, ,, 1·59 ,, ,,

You, therefore, need have no hesitation in probing to the bottom any statements made with respect to the duty of metallic filament lamps. You can easily test them for yourselves; and I think you will find you will be able to verify what I state.

Now, if we assume as our duty per cubic foot the mean between

15 and 25 candles, and take the mean of the metallic filament lamps at 1·59 watts per candle, we arrive at the fact that 1000 candle-hours will take 50 cubic feet and 1·59 B.T.U. respectively. Figuring on this basis, and also on the basis of only 15 candles per cubic foot—*i.e.*, 66 cubic feet for 1000 candle-hours—one gets the following results for 1000 candle-hours with gas at a definite price and electric current at a definite price.

Gas at s. d.	20 Candles per Cubic Foot.	15 Candles per Cubic Foot.	Electricity at
2 0	1·2d.	1·6d.	2d. per unit . 3·18d.
2 6	1·5d.	2·0d.	3d. ,, ,, . 4·47d.
3 0	1·8d.	2·4d.	4d. ,, ,, . 6·36d.
3 6	2·1d.	2·8d.	5d. ,, ,, . 7·95d.

In other words, excluding cost of burners and mantles and cost of lamps, gas at 3s. 6d. per 1000 cubic feet is about 50 per cent. cheaper than electricity at 2d. per unit, and even on the 15-candle basis is considerably cheaper. If I were to add the cost of burners and mantles and electric lamps, I should increase the advantage for gas. I do not pretend for a moment that there is anything particularly novel in this computation. What I do say is that it is based upon results which one actually gets; and I do not believe that sales are promoted, or any good done, by exaggerating for or against.

I might have gone on and added comparisons with high-power high-pressure lights and flame arc lamps. I have not done so, because it would involve one or two difficulties—*i.e.*, that in arc lighting the cost of producing light depends by no means solely upon the current, but also upon the cost of carbons and attendance, both of which are heavy items. It is difficult, moreover, to draw up any satisfactory set of figures, because the costs vary so much with the different types of lamp; and it is not my present purpose to go right through each kind of arc lamp, and each kind of gas-lamp, and make detailed comparisons. I do not think, however, that gas men need have any anxiety with respect to the cost of their product for light as compared with the cost of electricity for light.

Quality of Gas and Electricity.

We can therefore pass to another aspect of my first proposition—*i.e.*, the quality of the respective lights; and this takes me straight back to fundamental elements with respect to the nature of light. You will pardon this sudden leap back to physics; but it is necessary, in order for me to make my point clear.

Light and heat can be considered together. The theory which is extant, and generally accepted, is that known as the undulatory theory. It has for its basis the conception that all bodies and the celestial space are filled with a luminiferous ether, and that the movement of molecules in different bodies gives rise to a disturbance in this ether which partakes of the nature of rapid vibrations or waves. All practical forms of light are produced by heat; and it therefore follows that light-waves are present in juxtaposition with heat-waves. These vibrations, or light waves, have been well compared to ripples upon the surface of water. You are all familiar with the experiment which the physical lecturer makes with his ripple tank. He produces a disturbance by means of a pointer or his finger and ripples are formed and move forward in regular progression. The theory is that light-waves behave in the same manner; and it is customary to talk of the lengths and frequency of light-waves. In order to understand the term "length," one must, as you are aware, look upon these waves as though they were moving forward in a line at right angles to their front. They are very small indeed; and they move with a frequency which it is very difficult to imagine.

Now, it has been proved that the light-waves from illuminating sources as we know them—*i.e.*, the sun, electric arc and glow filament, and incandescent lamps—are all composed of waves of different lengths; and by means of a prism we can split up the component parts of light, which are violet, indigo, blue, green, yellow, orange, and red. These form the limit of the visible waves. The length of the extreme violet is about 1-60,000th of an inch; that of the extreme red, 1-39,000th of an inch. The red are the longest, and consequently move the slowest; the violet are the shortest, and therefore move the quickest. The red are adjacent to the infra-red and other rays which we can feel as heat, but we cannot see. The violet also are adjacent to some rays which we cannot see, because a piece of sensitized paper put in the path of the rays towards the violet end will become fogged. Further, a fluorescent substance—such as the well-known uranium glass or a solution of fluorescene is rendered visible by these same invisible ultra-violet rays.

It is possible to produce light the proportion of the component colours of which differs; and if we put a prism in the rays of different lights, the spectrum will show that in one case a band of one colour is more prominent than a band of another colour. In this way, experiment has enabled us to determine with great accuracy the composition of light emitted from different sources. Now, looking at these experiments, two essential facts must be remembered; and the last man in the world who should forget them is the man who makes gas. The first is that the human eye is more sensitive to the greenish part of the spectrum than to any other part. That is to say, one can see an object more clearly in a light which has more green in it than one can in a light which has more red or violet in it. The second is that the rays of light given off by incandescent gas contain an appreciably larger percentage of the green waves than do those thrown off by any form of arc or metallic filament lamp.

Herein lies, I think, one reason for an undoubted fact—that if you take a gas-lamp and measure it on the photometer, and find it to give 60 candles, and you take a metallic filament lamp, and find it to give 60 candles, the surface illuminated and the objects lighted up by these representative sources of light appear to be very much more bright in the case of the gas-burner than they are in the case of the electric lamp. Of course, in illuminating interiors one depends to such a large extent upon reflection from the walls, that the effect is not so apparent; but you have only to carry out the comparison that I indicate on lamp tests in the street, and you will be immediately struck by the evident proof of what I state.

The importance of this question of quality of colour of light cannot be too strongly insisted upon—particularly in view of Fechner's Law, which, reduced to simple form, means that within a rather wide range of absolute brightness of illumination our vision is, roughly speaking, about equally effective for most purposes. That is to say, it is not so important whether we have 100 candles or 60 candles; but it is important whether either the 100 candles or 60 candles contain a sufficient proportion of green light, to which the eye, as I have pointed out, is particularly sensitive.

Going back to the comparison of a gas and electric lamp of equal photometric power, there is a further possible reason why gas appears the brighter, which I do not think should be overlooked. It is an axiom that, for good illumination, the intrinsic intensity of the source of light per unit area should be small; and if we make a comparison in this respect as well, we find how much more suitable gas is for illumination than is electricity.

The intrinsic intensity can be derived by dividing the total flux of light from a source by the area in square inches of the source; and the result is expressed in candles per square inch. The following figures are more or less classical; and while I do not pretend to have measured the intrinsic intensity of the sun and sky, I may say that even my humble experiments have provided for me the remaining figures:—

Sun	600,000 candles.	
Sky	2 to 5 ,,	
Inverted mantle—		
Low pressure . .	20 to 35 ,,	according to effective duty.
High ,, . .	100 to 200 ,,	,, ,, ,,
Metallic filament lamp .	about 1000 ,,	
Flame arc lamp . . .	5000 to 10,000 candles.	

I think it is because the intrinsic intensity of the gas-lamp is so low compared with that of an electric lamp that the light appears to be so much better diffused, and altogether more suitable for the human eye. This is particularly noticeable with some forms of arc lamps and metallic filament lamps. The light proceeds from a small source, very vivid and brilliant, and very bad indeed for the eye, leaving a residual image on the retina, and being materially detrimental to the sight. I have mentioned these two points because I think gas engineers overlook them very frequently; and when they are faced with competition with respect to domestic or public lighting, they are too ready to rest content with photometric comparison, and fail to avail themselves of these physical facts, which do not rest upon the authority of such an obscure person as I am, but are founded upon the research of our great scientists who spend all their lives in making these investigations.

I am aware that, with respect to providing light, a gas engineer is confronted with the convenience of electricity; and this convenience is an undoubted fact. But modern methods of gas lighting are also convenient; and even though it can be truthfully admitted that the balance is distinctly in the favour of electricity in this direction, yet the other points in favour of gas lighting ought to be urged strongly, and should in very many cases be sufficient to turn the balance.

The Bogey of Poison.

The bogey of poison in the products of combustion is always promulgated; and all I can say is that, if I were a gas manager, I should not be content to act on the defensive in respect to the air consumed and the products given off by a gas-lamp, but should rather make this a point of attack, and emphasize the very beneficial result to the ventilation of a room where gas is used for illumination, as a consequence of the circulation and replacement of the air, as compared with the stagnation and sourness that occur when electric light is used. I should also like to point out that it has been very fully demonstrated that the combustion of gas gives rise to the production of an active germicide; and in these days, when we think in germs, this must surely be counted an advantage.

I hope no one will assume that I am making an attack upon the electric light, and being partial in any shape or form. I am free to admit that there are lots of cases where I would let everything go by the board save the convenience and adaptability of electricity, and would not have gas light; but I am endeavouring to point out facts as they are, and to do so in a moderate way. So much for my first proposition.

The Prospects of Improvement.

My second proposition was made so long ago that I have almost forgotten it; but it was, "What are the possibilities of improving your own and the electrical engineers' position?" Now, in this respect, I am free to confess I think the electrical engineer stands at least as well as you do. With gas as it is made now, and burners as they are conceived, it may be true that there is not very much possibility of greatly improving the duty that one

obtains from a cubic foot of gas. From what I have been privileged to inspect only last week, I think, however, that the gas industry may look forward to seeing shortly a most important, and probably far-reaching, development in the matter of burners for use with mantles.

Electricity, on the other hand, is hot-foot in pursuit of an idea —*i.e.*, using vapour as a conductor of current—which I think will, in perhaps the near future even, be productive of great results. Already we have had the mercury vapour lamp, which, but for the unsuitability of its colour, was thought fairly efficient; and you may have read of the experiments which are being made with neon, which, as you know, is one of the rare gases that Sir William Ramsay and others have produced from ordinary atmospheric air, and stands in the same category as argon. Experiments are now being made to employ this gas, obtained from liquid air; and by passing current through it in an exhausted tube one obtains a glowing mass of light. You will see this is quite a new line; and when once an experimentalist commences to act, modern experience shows it is not many years before his experiment materializes in the shape of practical results.

What can, and should, a gas engineer do to bring about improvement in his own products? To begin with, I do not believe anything like sufficient interest is taken in the question of reflection from polished surfaces or through prisms. The possibilities of altering the angles of distribution, and of increasing the advantage in the tone and colour of the light, are all very great, it seems to me; but I can give you an example of this in a recent experience of my own.

In experimenting with a process for gold-plating mirrors, instead of silver-plating mirrors, for searchlights, I found that, though the illuminating power of the reflected light is not so great in the former case as in the latter, yet one can obtain very much better definition of objects lying on the ground, and so on; and I take the reason to be that the gold-plated mirror gives off a larger proportion of the green and yellow rays, mixed with some of the red, than does the silver mirror—the rays from the latter containing, of course, a large proportion of the cold violet rays from the extreme end of the visible spectrum. Again, if one compares the two reflected lights, the silver has a dazzling effect, and the gold has not. This, you will see, is a repetition of what I have been trying to say—*i.e.*, that a great deal of the real value of light lies in the quality of its composition—and if you can do anything to further increase the advantage you hold in the useful composition of incandescent gas-light, surely you can awaken experiment in those whose business lies in that direction, so that this advantage may be further improved by means for bettering the quality by suitable reflectors, and the like, prepared in a suitable way.

It must be understood that, as light is produced by vibrations set up by the application of heat to form incandescence (even the flat flame derives its light from the incandescence of its carbon particles), it follows that every bit of light obtained is accompanied by an enormous expenditure of energy, which spends itself, but does not show itself in the invisible heat-rays. It is a fact that only 1 per cent. of the energy of any known form of artificial light produced by heat (and this includes arc and filament lamps) re-appears in the form of light; so that there is an enormous field for converting this energy into light by means of producing a greater light with less expenditure of heat. Whether or not this is possible working on lines at present presumed, is a matter of grave doubt; but, as the text-books tell us, if we can borrow the secret of the fire-fly, we shall enormously conserve the sources whence we derive light.

Another, and more immediate, direction, in which we should, I think, cast our thoughts is that of producing low-grade gas, not by increasing its percentage of inert constituents, but by setting ourselves to attenuate the hydrocarbons, so that, while increasing in volume, they decrease in intrinsic calorific power, and cause our finished product to get nearer the point where we can obtain the heat we require to render our mantles incandescent by the admixture of just the right amount of air. As the effectiveness of the combustion depends, I believe, not only upon the quality of the gas, but upon the pressure at which it passes the nipples of our burners, I think there is room for a great deal of work on these lines, and for the production of burners in which the proportions are so arranged that a cubic foot of gas at 6 inches pressure will give us more light than a cubic foot of gas at 2 inches pressure.

However, within the limits of the time I feel I can expect you to devote to my remarks, it is impossible to travel through all the points arising in connection with this fascinating subject.

In conclusion, I think we can honestly say that your industry has made great strides from every point of view since I last addressed you; and I believe that, if you go on looking facts fairly in the face, the future of gas as a lighting medium will be just as great as has been the past.

[The remarks made by speakers at the meeting, when proposing a vote of thanks to Mr. Abady for his lecture, are reported on p. 357 of to-day's issue.]

The late Mr. W. D. Cruddas, the Chairman of the Newcastle and Gateshead Water Company, whose death was recorded in the "JOURNAL" for the 13th of February, left estate of the gross value of £1,041,320, with net personalty amounting to £882,997. Dr. Edward Divers, F.R.S., whose death was recorded in the "JOURNAL" for the 16th ult., left estate of the gross value of £2121.

ECONOMY OF DIFFERENT RETORT-SETTINGS.

A summary was given in the "JOURNAL" for April 2 (p. 29) of an exhaustive analysis, by Dr. R. Nübling, Manager of the Stuttgart Gas-Works, of the cost of manufacturing gas by different systems of retort and large chamber settings now adopted on a large scale in Continental gas-works. Dr. Nübling concluded that settings of through horizontal retorts operated by machinery were equal in point of efficiency and economy to any other type of carbonizing plant at present in use on a working scale. In a subsequent number of the "JOURNAL," an abstract translation was given of an article by Herr W. Bueb, in the course of which he argued that Dr. Nübling had underestimated the life of Dessau vertical retort-settings, and that in reality the latter showed, even for works of moderate size, a considerable economy over other types of carbonizing plant. In a recent number published by our contemporary, the "Journal für Gasbeleuchtung," Herr H. Zollikofer, the Manager of the gas-works at St. Gall, Switzerland, deals *seriatim* with the points made by Herr Bueb. His remarks may be briefly summarized as follows.

Though vertical retort-settings may have as long a working life as horizontal or inclined retort-settings—say, as much as 25 years—it is unwise to reckon depreciation on such a basis; for the simple reason that, before the lapse of this time, new types of carbonizing plant will have been introduced, and will displace those which now rank as best. In regard to the maintenance of the settings, it should be remembered that occasionally a life of 1600 or even 2000 working days has been attained with the old types of retort-settings; but that such figures are regarded as exceptional, even by the Vertical Retort Company, is shown by the fact that they do not guarantee the life of vertical retorts at more than 1000 working days. It is difficult to understand why, if so little refractory material is used in the internal construction of vertical retort-settings, the settings are so costly. In comparing the life of the fittings of the retorts, regard should be paid to their first cost. The coke-conveying plant is of the same length with vertical retorts as with other settings of the same productive capacity. The fuel consumption for different types of retort-settings has been established by independent tests made by the Carlsruhe Instructional and Experimental Works. The cost of labour per 1000 cubic feet of gas made depends, not merely on the system of carbonization and the arrangement of the coal-conveying plant, but also on the size of the installation. A true comparison can be made only after installations of the same productive capacity have been in work for some time. It may be conceded that larger settings than are customary may be taken as the units for the minimum summer make of gas. But it may be observed that the subdivided settings described by Herr Bueb, in which the divisions contain three or six retorts, will show very different working results, and the cost of installation will be very different from the undivided settings of eighteen vertical retorts.

In the comparative table of the working charges given on p. 33 of the "JOURNAL," Dr. Bueb has taken for comparison settings of six and eight horizontal retorts of medium cross section and short length, and compared them with Dessau vertical retorts of the standard cross section and 13 feet in length. Such a comparison does not seem fair. In the reckoning of wages for the summer make, of 87,500 cubic feet per day, Herr Zollikofer thinks an error has been made in the case of both types of settings. In comparing the cost of gas by the different systems, he finds that the make of gas per ton with the vertical retorts has been taken at 12,811 cubic feet, and with the horizontal retorts at only 10,801 cubic feet. The difference amounts to 19 per cent.; and the calorific power of the gas should be taken into account. According to Dr. H. Bunte, the calorific power of the gas made in the Mariendorf and Zürich vertical retort-settings with steaming is from 92 to 95 per cent. of that of the gas made without steaming.* There must be at least as great a difference in the calorific power of the vertical retort gas and the horizontal retort gas which Herr Bueb has taken for comparative purposes. In comparing the working expenses, the cost of installation should be taken into account. This should include, not merely the carbonizing plant proper, but also the retort-house and the coal and coke conveying plant. Interest, depreciation, and maintenance charges on the capital cost of all this plant should be included in arriving at the cost of manufacturing the gas. The cost of power for the machine coal breaking and conveying plant should also be included. Only by including all these expenses, can, in Herr Zollikofer's opinion, a true comparison of the different types of retort-settings be made. Such a comparison should be made on the basis of rather larger installations, as vertical retort-settings have hitherto been rarely adopted for quite small makes.

* See "JOURNAL," Vol. CIV., p. 256.

Owing to the title of "Co-Partnership Journal" having been registered by the South Metropolitan Gas Company, the monthly publication of a similar character issued by the neighbouring Company appears this month as the "South Suburban Gas-Works Journal." The contents include an article on "Asbestos," by Mr. A. V. Hendrickson; and the first of a series of articles entitled "Where We Live," by the Editor (Mr. B. A. Hewitt), who discourses on Sydenham.

EXTENSIONS TO THE CARBONIZING PLANT AT THE EAST HULL GAS-WORKS,

WITH NOTES ON WORKING RESULTS.

By R. Nelson, of East Hull.

[A Paper read before the North of England Gas Managers' Association, May 4.]

The extensions to the carbonizing plant at the works of the East Hull Gas Company, recently carried out, have Dessau vertical retorts as the principal feature, with auxiliary plant not presenting any very special departure from usual practice, yet a general description of the plant as arranged will perhaps be of sufficient interest to record. Therefore the writer ventures to lay before you the following notes.

Retort-Bench.

The retort-bench comprises five beds of Dessau vertical retorts, each containing eighteen 13-feet retorts set in rows of threes. The cross section of the retorts is 22½ in. by 14½ in. at the bottom, tapering to 17 in. by 10 in. at the top. Each of the five beds measures 15 ft. 6 in. between the division walls and 19 ft. 4½ in. from back to front, inclusive of the producer; the height from the ground level to the top of the bench being 21 ft. 9½ in.

The ground space occupied by the bench is 1686 square feet, which is equal to 20·5 square feet per ton per day, based on the maximum carbonizing capacity. The retorts are supported on a cast-iron platform, carried by steel stanchions and girders; the brickwork of the bench being buttressed by steel buckstays coupled longitudinally and transversely by suitable tie-rods. In addition, each side of each bed is further supported by six vertical binders of rolled steel joist section. The lower ends of these binders on the retort side of the bench are connected to the horizontal girders carrying the retort base-plates; while the upper ends are braced with horizontal bars and connected by tie-rods across the bench. Portions of the front walls of the bench are faced with "Thermalite" bricks; and the whole area of the top of the settings—between the mouthpieces—is treated in a similar manner. This forms a very satisfactory insulation, and any loss of heat by radiation is thereby greatly reduced.

The retorts are coupled in sets of threes. At the top all three mouthpieces deliver the gas into one take-off pipe, 6 inches in diameter. The charging doors are operated singly, by hand. The discharging doors are hung on one shaft, which is operated by hydraulic gear, controlled from a convenient position outside the setting. This gear consists of two hydraulic rams directly connected to a set of racks, which, in turn, operate clutch pinions keyed to the main shaft carrying the doors. Suitable selecting gear is provided so that the attendant can, by means of a "dog," select and gear-up any desired clutch pinion coinciding with the retorts to be discharged. Each bed is provided with hydraulic gear as described. Three sets of eccentrics for each line of retorts are carried on a secondary shaft; while the door catches are operated by a third shaft. All the operations are performed at the same point outside the settings. Further, to the eccentrics just mentioned, each door is fitted with two additional eccentrics, operated separately by hand. Mention should also be made that means of operating the bottom doors of the retorts by hand are provided, consisting of a special screw-jack, which can be geared to any set of racks. This furnishes a stand-by in the event of a breakdown to any part of the hydraulic operating gear.

The furnaces are of the "step-grate" type; and it has been found necessary to clean the fires only once in twelve hours. This cleaning consists in pricking the fires, and raking-out the small amount of clinker formed, which is easily removable between the bars of the furnace. Spear bar doors were provided; but up to the present they have not even been opened.

The producers are the full depth of the settings; but as the gas-ports are about 8 feet up from the bottom, there is ample reserve of coke on the top of them, sufficient to last at least eight hours in the case under notice.

The gas take-off pipes deliver into hydraulic mains of a special pattern, fitted with access doors protected by a sealing diaphragm, so as to permit of the pitch pans being introduced and withdrawn during gas making. Each bed is provided with a separate length of hydraulic main, supported on joists carried from the buckstays by brackets, and fitted with regulating screws to admit of adjustment. The gas outlet from each hydraulic is 10 inches diameter, and is connected by a vertical pipe to a horizontal collecting main 24 inches diameter, extending the full length of the bench. This collecting main is fitted with diaphragm plates, about 5 inches in depth from the bottom of the main, in sections corresponding to each hydraulic main. This serves for the collection of the condensed liquors and tars, which can be returned at will to the hydraulics, through the medium of 3-inch valves and connections. Thus the dip-pipes can be rapidly sealed as desired. A 12-inch Peebles' retort-house governor controls the whole bench.

The tar-main is 6 inches diameter, connected to each hydraulic main by a 6-inch weir valve. In addition to this, 2-inch tar-cocks are fitted to the bottom of each hydraulic main, delivering into a 2½-inch tar-main, which is connected to a tar-tower at the end of the bench, and which is used primarily for flushing purposes.

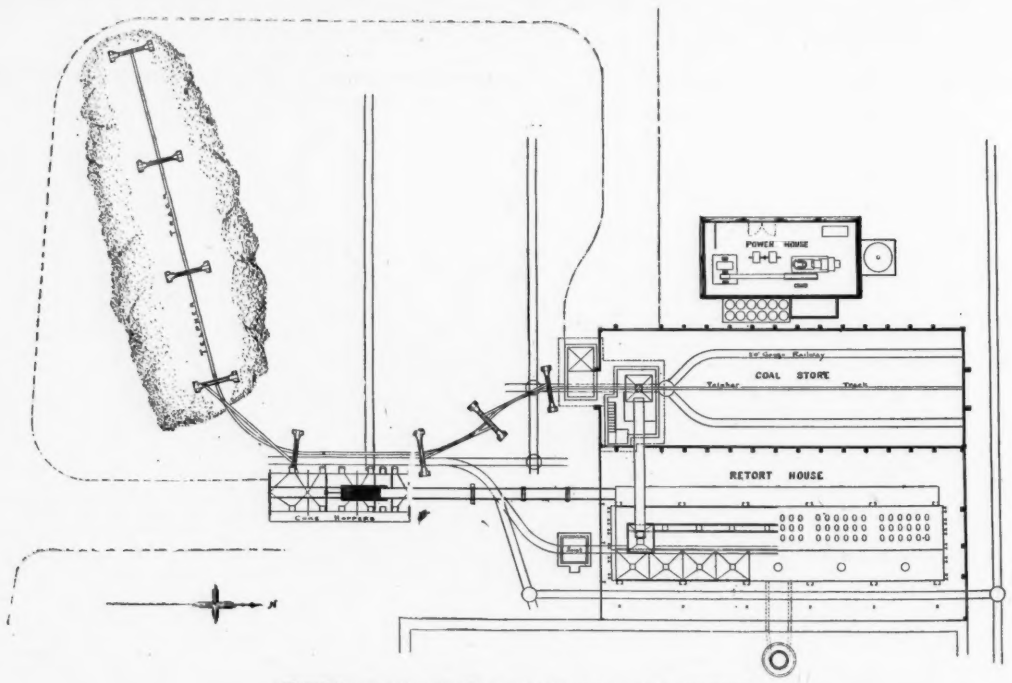
The overhead coal storage and breeze bunkers have a capacity equal to supplying the whole of the retorts for twenty-four hours, and are supported upon a girder framework carried on extensions of the buckstaves. The coke-bunkers are of sufficient capacity to contain about 36 hours' fuel for the five producers. The chimney serving this bench is of steel, 4 ft. 6 in. diameter by 80 feet high, lined the full height with fire-brick.

Retort-Bench Foundations.

The retort-bench is carried on a reinforced concrete raft; "Kahn" trussed bars being used throughout. The spread of the foundations was arranged so that an even weight per superficial foot of ground surface was obtained throughout the whole area.

Retort-House Building.

This is 44 feet in width, and constructed of steel framing in accordance with the usual practice. The main roof span is carried by extensions of the bench buckstays; the walls being panelled



GROUND PLAN OF THE EAST HULL GAS-WORKS.

with reinforced concrete. The side roofs are carried by cantilever principals, so that the retort-house building is entirely independent of any adjoining structure. The walls consist of "Hy-rib" sheeting fixed direct to the steel framing; and a thickness of 2 inches of portland cement and sand, in the proportions of 1 to 3, was plastered direct on to the sheeting. The first coating of this plaster was gauged with a rich lime mixture containing a large amount of hair as a binding. This construction admits of fairly rapid work, and, so far as can be seen, is very satisfactory.

The north or permanent gable is entirely of reinforced concrete on the Trussed Concrete Steel Company's principle, and is panelled; the main beams being 16 in. by 12 in., filled in with a 4½-inch slab. The beams are placed inside. Thus the gable presents a perfectly plain surface outside.

This was adopted so as to reduce the cost of building the gable, as with this design it was safe to assume the beams as being of T section when considering their strengths. The south gable is constructed of steel framing, covered with galvanized corrugated sheeting, to admit of the future extension of the plant.

All roofs are covered with slates, carried on angle steel purlins and fastened with lead nails; no timber being used.

Centrally pivoted windows, of light steel sections, are used throughout; and skylights and ventilators are provided where necessary.

Breaker and Skip Pits.

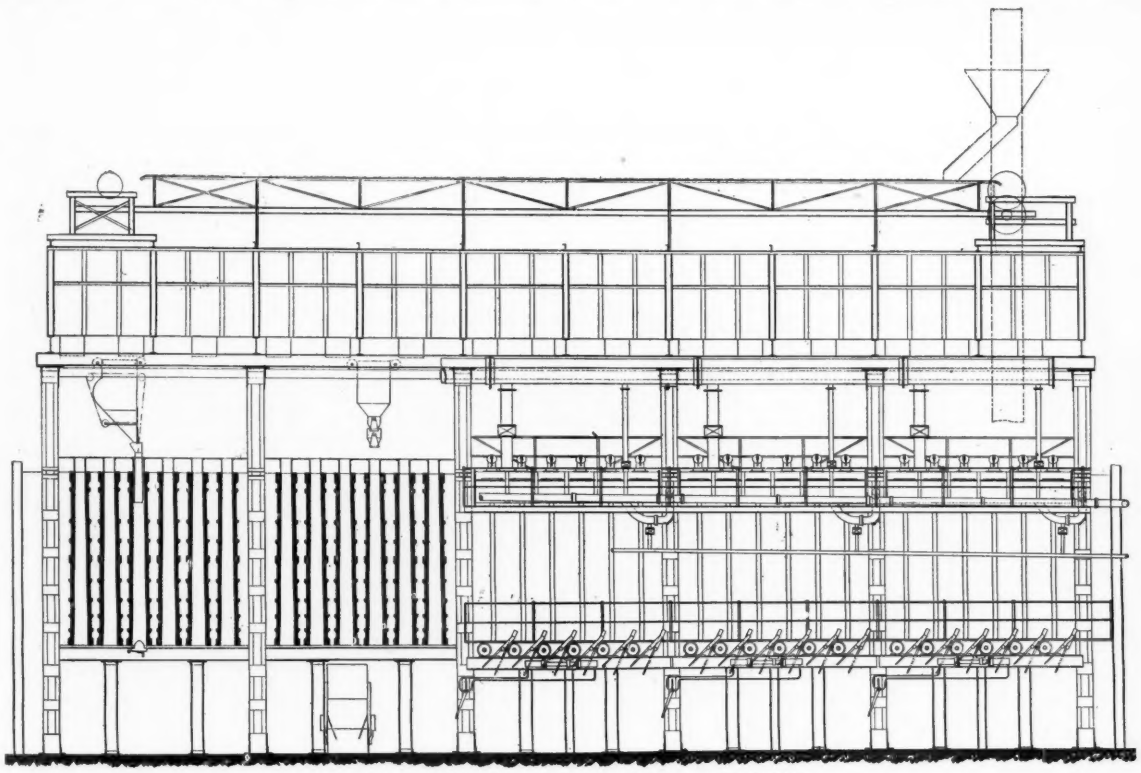
It was ascertained previous to commencing work on these pits that a bed of running silt had to be excavated. It was therefore decided to adopt sheet piling; and 9 in. by 4 in. tongued and grooved pitch pine piling was driven all round the site of the pits to a depth of about 5 feet below the necessary excavations for same. This piling was left in place, and concrete walls, having a minimum thickness of 18 inches, were moulded in front of the timbers. On the inner faces of these walls, and also on the bottom of the pits, a thickness of 1 inch of rock asphalte was plastered—being put on in two thicknesses of ½ inch each. In front of this, 9-inch walls of blue bricks, set in portland cement, were built; forming the inner faces of the finished pits. These pits have so far proved perfectly satisfactory in every respect.

Coal-Store.

This runs the full length of, and parallel to, the retort-house. It is 30 feet wide and 30 feet high from the ground level to the eaves. The walls are of reinforced concrete on the "Kahn" system, 4 inches thick, with vertical beams 15 in. by 10 in. at intervals of 6 feet. These vertical beams are connected at the tops by reinforced concrete cross beams; and the bases are connected transversely by tie-rods in the concrete floor. The walls were designed to sustain a thrust from coal stacked to a height of 22 feet. The roof is slated and carried by steel principals—both sides being provided with skylights the full length and 5 feet deep.

Coal-Handling Plant.

All the coal used at the works has to be carted from railway sidings situated about a quarter of a mile from the site of the works. As received by carts, the coal is tipped into a receiving



LONGITUDINAL SECTION OF THE RETORT-HOUSE.

hopper in the coal-store, and then passed through a jigging screen, which delivers the large coal into a breaker of the four-roll type, and the small coal direct to the boot of the elevator, by means of a bye-pass shoot.

The elevator is of the 18-inch cased-in type, having a capacity of about 25 tons per hour. At the elevator head the coal is delivered into a hopper. From this there are two outlets—one for the conveyor and one for filling tip waggons in case of emergency. A conveyor of the 18-inch push-plate type is fixed over the continuous storage hoppers.

All the foregoing plant is driven by means of electric-motors.

Coke-Plant.

The hot coke from the retorts is directed, through the medium of a travelling shoot, into the trough of a hot-coke conveyor of the De Brouwer type. This conveyor, after it leaves the retort-house, is inclined at an angle of about 30°; and the coke is delivered either direct into a mixed coke-hopper or to a revolving screen. This screen is arranged for three sizes—namely, breeze, small, and large; each size falling into a separate compartment of the hopper. On one side of this coke-hopper, suitable shoots are arranged for filling either carts or skips; the shoots being fitted with balanced radial cut-off doors, which may be operated either from the ground level or from the cab of the telpher. As the coke trade is entirely local and sent out in bags, the other side of the hopper is fitted with special bagging shoots; and a platform is arranged at a convenient level for lorries.

In connection with the hot-coke conveyor, it may be mentioned that the trough is entirely enclosed; hinged doors being provided throughout the length of the retort-house for the entrance of the coke from the retorts. Water sprays are fitted for quenching purposes. The inclined portion of the conveyor is also entirely enclosed; and this carries the steam generated over the coke-hoppers. [Incidentally, the steam confined within the conveyor trough assists in the quenching of the coke.] No attempt was made to make the conveyor trough within the retort-house steam tight, yet the covering is a great protection to the men operating the gears of the bottom mouthpieces.

In connection with the coke handling, arrangements are also made for bringing the coke out of the retort-house by hand in case of a mishap to the conveyor. This stand-by consists of an endless wire rope, running the full length of the retort-house immediately beneath the retorts and for some distance outside the house, operated by a crab-winch fixed at the extreme end outside. Tip waggons may be attached to this rope for receiving the coke direct from the retorts, and hauled in and out of the house as required.

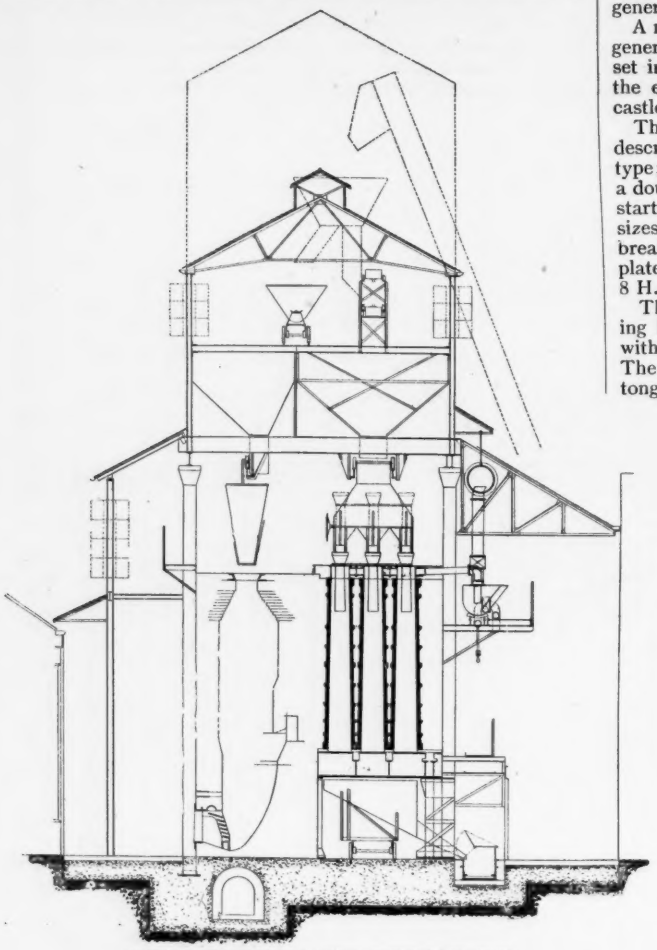
Coal Storing and Coke Stacking Plant.

This consists of a combined telpher scheme as shown on the plan. The outside track runs alongside the coke-hoppers, and from these over the coke yard; being supported by built-up steel trestles. This enables the telpher operator to load the skip at the hoppers and stack the coke in the yard without assistance—a self-

emptying skip being used. The track is continued into, and runs the full length of, the coal-store; being centrally hung from the reinforced concrete beams spanning the store. Immediately under the telpher track, on the outside of the coal-store, is an underground coal-receiving hopper and skip-filling pit.

The method of storing coal is as follows: As received by carts, the coal is tipped into the hopper, which is provided with a suitable outlet communicating with the skip-pit. This outlet is fitted with a cut-off door of the radial type, which can be operated from the cab of the telpher. The driver, having lowered the skip into the pit, fills the same with coal. The skip is then raised and travelled into the store, and the coal deposited in a manner similar to the case of coke stacking, as already described. For bringing the coal out of the store to the hopper over the breaker pit, a grab of the "Priestman" type is employed; a few minutes only being necessary to effect the change from skip to grab. The telpher thus serves the two fold purpose of dealing with both coal and coke.

The telpher is of Messrs. Booth Brothers, of Rodley, make, and is provided with a rope barrel grooved right and left hand to take the steel wire hoisting rope. An automatic brake is incorporated in the hoisting gear, applied by dead-weight and released



CROSS SECTION OF THE RETORT-HOUSE.

by electric solenoid whenever the current is passing to the motor. A hand release arrangement is provided to this brake for permitting loads to be lowered by gravity. A foot-applied brake is also fitted to the travelling mechanism. A patent automatic circuit-breaker, for the prevention of both over-winding and overloading, is incorporated. Both motors are of the totally enclosed series-wound reversing type.

Hydraulic Plant and Coke Hoist.

One of Hayward Tyler's duplex steam hydraulic pumping engines is installed in the power house, fitted with balanced steam actuating valve placed on the exhaust side and regulated by a lever from the accumulator, to start and stop the pump according to the requirements of the accumulator. Spring water-relief valves are fitted to each of the cylinders to drain them. The pump receives its water supply from a small overhead tank, and all spent water is returned. The accumulator is 9 inches in diameter by 10 feet stroke, and is weighted to give a working pressure of 700 lbs. per square inch. An automatic momentum valve is fitted to act as a safety valve. The hydraulic hoist is fixed at the south gable of the retort-house, and is used for lifting the coke to the overhead bunkers as required for the producers.

A system of narrow gauge railways is laid down between the coke hoppers and the hoist; and side-tip waggons are used for conveying the coke. Railways are also provided between the hoist and the coal-store, so that the coal may be brought from the latter in tip waggons to the hoist and elevated to the overhead coal-storage bunkers in case of a breakdown to the elevator.

Generating Plant.

The electric generator is of the four-pole direct current type, wound for an output of 70 kilowatts, 220 to 230 volts, at 500 revolutions per minute. It is of the three-bearing type, and is mounted on slide rails for adjustment. The drive is by belt from a gas-engine of the National Gas-Engine Company's Y.E. type, capable of developing 105 B.H.P. continuously, and 10 per cent. overload for short periods. The engine is fitted with a hand pump self-starter; and the ignition is electric, from duplicate "Bosch" magnetos. The switchboard is built up of enamelled slate panels, and fitted with the usual regulators, ampere meter, and volt meter, with additional ampere meters to each separate circuit.

The gas-engine and main generator were put down of sufficient power to serve an installation double the size of the present one. In addition to the gas generating set, a motor generator set is fixed—taking current from the town supply at 440 volts and generating current at 220 volts.

A main throw-over switch is provided, so arranged that the two generators cannot be run in parallel—the act of switching one set in automatically throwing the other set out of circuit. All the electric plant is by Messrs. J. H. Holmes and Co., of Newcastle-on-Tyne.

The motors throughout, with the exception of those already described for the telpher, are of the totally enclosed shunt-wound type; each being supplied with a separate starting panel, containing a double pole totally enclosed switch with external handle, and a starting switch fitted with no-volt and overload release. The sizes of the motors are as follows: One 12 H.P. for the coal breaker; one 10 H.P. for the elevator; one 8 H.P. for the push-plate conveyor; one 20 H.P. for the coke conveyor; and two 8 H.P. for the telpher.

The whole of the generating plant is contained in a brick building having a terra-cotta tiled floor; the walls being plastered with portland cement and sand, finished with "Parien" cement. The roof is carried by steel principals, slated, and covered with tongued and grooved "sarking."

The whole of the materials used in the construction of the plant are of British manufacture, with the exception of the lower half of the retorts and the material forming the lower portions of the combustion chambers, which are of German manufacture.

Capital Costs.

—		Per Ton per Day.
	£	£
Retort-house, slated roofs, one gable of reinforced concrete, one gable of steel framing covered with galvanized corrugated sheeting, also retort-bench, bunkers, retort-house governor, chimney, and paving of house	11,999	148·13
Breaker and skip pits	653	8·06
Bench and chimney foundations	585	7·22
Coal-handling plant	727	8·99
Coke-handling and screening plant, including hydraulic hoist, accumulator, and foundations	1,687	20·83
Coal-store of reinforced concrete and slated roofs, including foundations and floor	1,165	14·38
Telpher plant for coal and coke, including foundations	900	11·11
Generating plant (gas and motor generating sets), including house and foundations	1,995	24·63
New roadways, light railways, drains, &c.	523	6·45
	20,234	249·80

The above analysis is based on the quantity of coal capable of being carbonized per day, working with ten-hour charges —viz., 81 tons.

Labour Costs.

Based on carbonizing 68 tons of coal per day as at present:—

	Pence per Ton.
Four carbonizers, at 6s. per shift	4·24
Scurfing and attendance to hydraulic mains, &c.	0·90
Coal and coke handling	1 13
Exhausters and boiler men	2 06
Foremen	1·15
	9·48

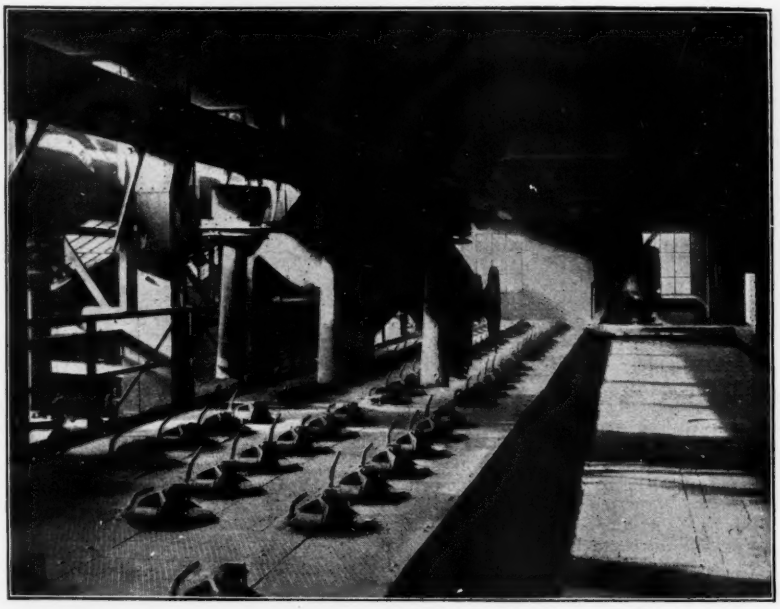
After drying the settings carefully for from six to seven weeks, carbonizing was commenced on Oct. 6 last. For the first two weeks, three beds only were in use, to enable the men to accustom themselves easily to the management of the settings, after which all five beds were brought into full use for gas making.

Twelve-hour charges have been worked throughout; and it was soon found that, under the circumstances obtaining, two hours of gentle steaming could with safety be adopted. This has up to the present invariably been the case, although for some time from the commencement a portion only of the retorts were steamed.

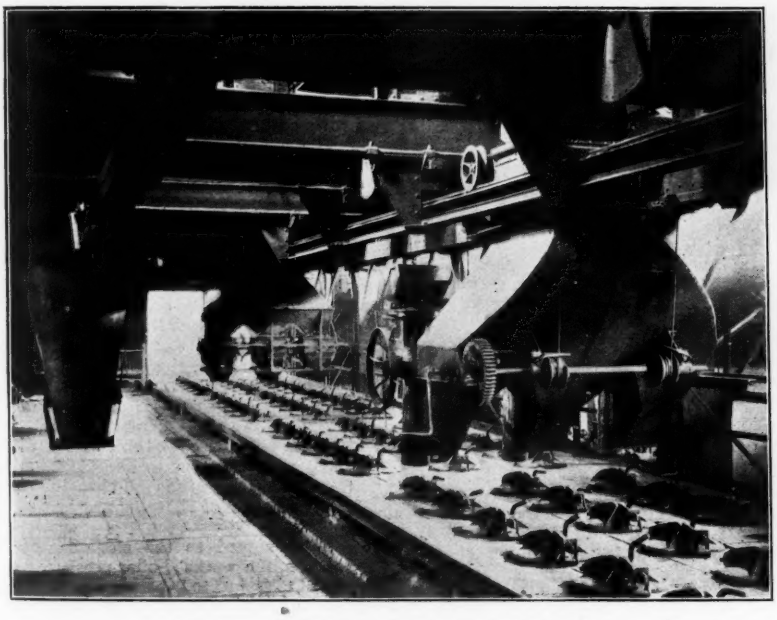
It should be noted that only two eight-hour shifts are worked

in the twenty-four hours—no carbonizers being employed during the hours of from two until six o'clock, mornings or afternoons. This enables each shift to go through the whole of the five beds once—namely, thirty discharges and charges respectively per shift. The four carbonizers employed (two per shift, one on the top and one on the bottom of the bench) do the whole of the work in connection with discharging and charging of the retorts, filling the producers, cleaning fires, attending to steam, rodding pipes, and cleaning-up generally.

With the five beds under these conditions, 68 tons of coal per day have been regularly carbonized; being equal to 17 tons per man per day. This is also equal to 23 cwt. per charge per set of three retorts on the average. It is not claimed that this is by any means the best that can be got out of the settings, as it has been necessary to adapt the plant very strictly to the local conditions obtaining at the particular time. The writer hopes to have the opportunity of thoroughly testing the plant under various conditions, and with a variety of coal, during the coming summer, and would point out that the figures given later as to the working results relate to the working of the installation as described, and over the period from the date the verticals were isolated up to date.



THE CHARGING STAGE.

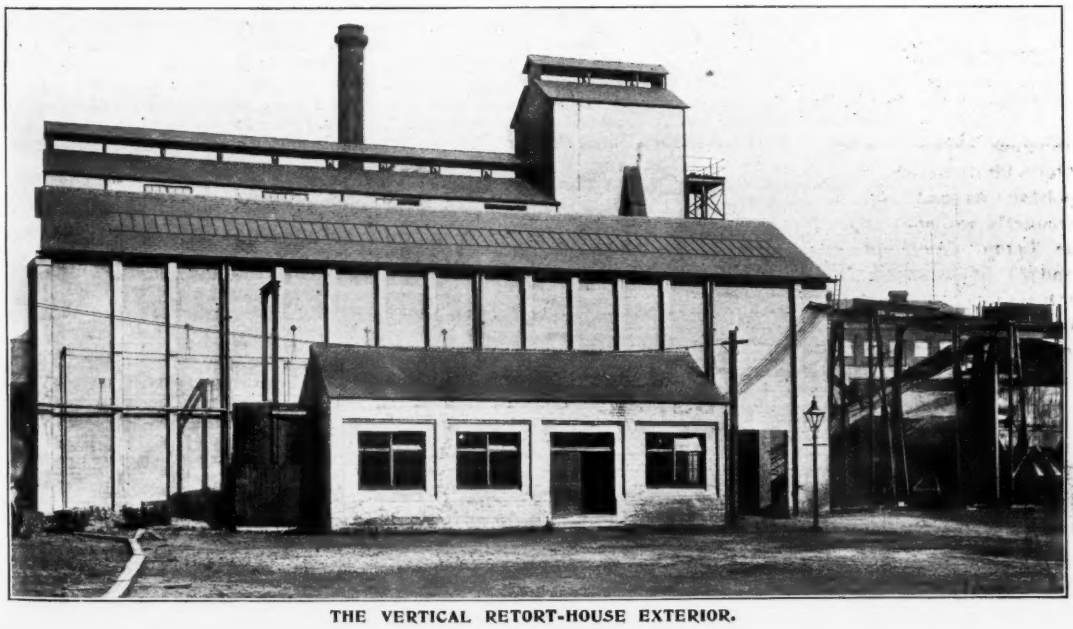


ANOTHER VIEW OF THE CHARGING STAGE.

For the first five months the verticals were worked in conjunction with an old hand-worked horizontal house; but since Feb. 17, they have been worked entirely alone. The carbonizing capacity of each retort varies from about 7 to 8½ cwt., according to the thickness of carbon on the inner face. It has been the practice to scurf the retorts once every five weeks; and with the installation under notice, this allows one set of three retorts to be laid-off for scurfing each day—Sundays excepted. The method of removing the carbon is no doubt well known, but may be here shortly described.

After emptying the retorts, the bottom doors are slung open on hooks, to the extent of from 2 to 2½ inches. The top lids remain open; but the mouthpieces are covered with adjustable plates having notches cut in them. With these the draught through the retort is under control, and may be regulated to suit varying conditions. After a few hours' burning, the carbon is invariably found to be in a condition to allow of its easy removal. As a rule, the retorts are ready for charging well within twelve hours of laying them off for scurfing.

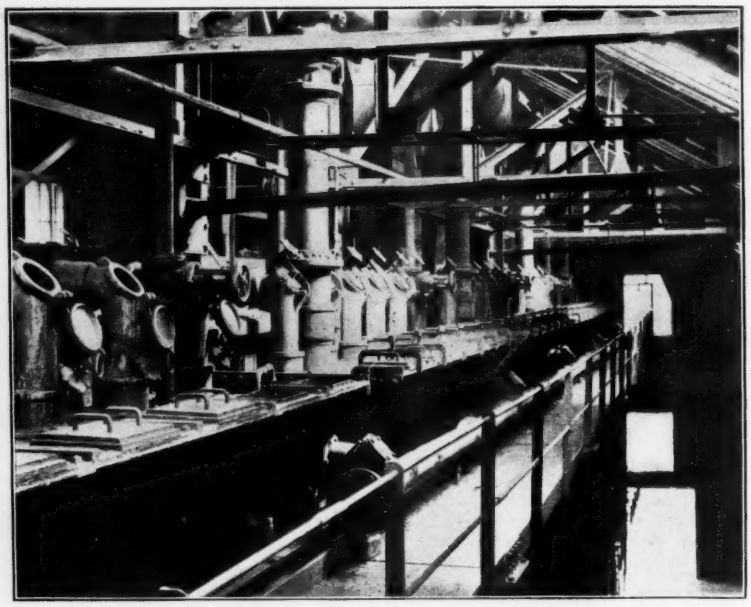
The carbonizing capacity of a set of



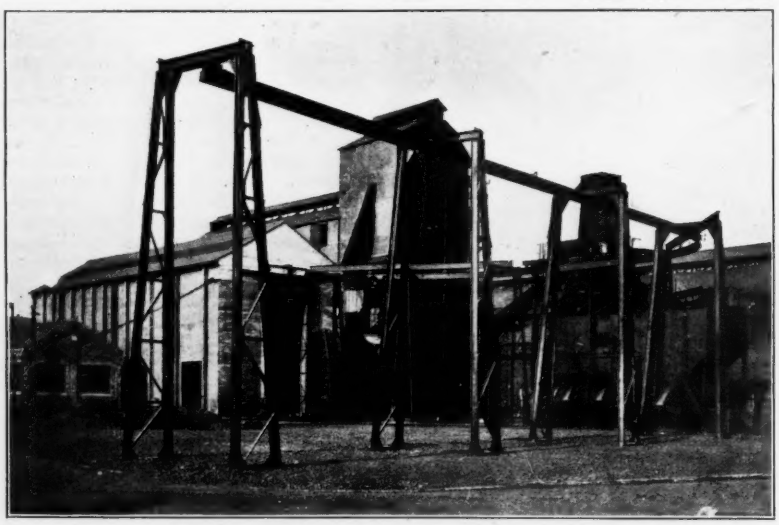
THE VERTICAL RETORT-HOUSE EXTERIOR.

retorts not only varies according to the time elapsed since the scurfing period, but the respective capacities of each retort forming the set may also vary. As the three retorts are charged simultaneously, it is thus seen that a fixed measured charge is not practicable. What is required is that each retort will always be charged to the proper height, irrespective of the quantity of coal contained. The principle adopted at East Hull is to make each retort its own measuring chamber, and to provide means of automatically cutting off the flow of coal after each retort has received its proper quantity. This is attained by means of the charging-machine shown on the drawings. It consists in the main of a travelling hopper, running on overhead rails fixed immediately under the coal-storage bunkers, and receiving a supply of coal immediately from these bunkers. The machine then delivers the coal to the three charging-tubes, through openings having vertical doors operated, by racks and pinions, by one shaft; the hand-wheel being well to one side of the machine.

Prior to the commencement of the charge, these tubes, which are hung on to a common frame, are lowered into the retorts by a small hand winch, operating rope barrels—two wire ropes carrying all three tubes. The whole of the gear is carried on the machine, and the winch handle is fixed in close proximity to the hand-wheel controlling the doors of the shoot. The tops of the tubes are provided with special shaped funnel mouths. The coal is then delivered into the retorts through these tubes and allowed to run until it not only reaches the bottom ends of the tubes, but piles up in the tubes and so on, up to the doors of the hoppers. These doors are then closed, and the tubes lifted, during which latter movement the coal contained therein drops into, and completes the charge in, the retorts. The tubes are constructed of such cross section that the coal contained is just sufficient to bring the charge up to the proper level. It will thus be seen that the tubes are introduced into the retort some little distance below the required finished level of the charge—in this case, about 1 ft. 2 in. Although the foregoing description of charging may sound somewhat formidable, yet in reality it is a very simple, and withal an expeditious, process.



THE HYDRAULIC-MAIN GALLERY.

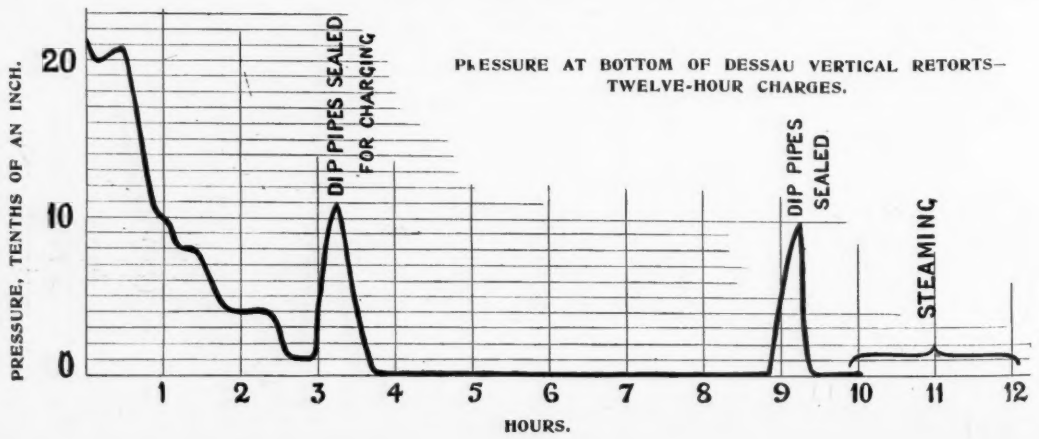


THE COAL AND COKE TELPHER PLANT.

Showing that the work is carried out as described, it has been noticed from time to time that two out of the three retorts of a set may take their charge (say) 4 or 5 seconds sooner than the third; yet when finished all three charges stand at the same relative level. It is also claimed that, with the use of this arrangement of charging shoot, the coal is deposited in a much lighter manner than would otherwise be the case.

Previous to charging, a small amount of breeze (about 70 lbs. per retort) is introduced into each retort, for the purpose of filling up the bottom mouthpiece. This breeze is fed into all three retorts simultaneously by a separate shoot, running on the same rails as the coal-charging shoot. All operations of charging are carried out by hand.

With regard to the steaming of the charges, the works' boiler pressure is reduced to from 5 to 8 lbs. per square inch at the inlet of the steam-pipes supplying the bench. Each retort is provided with a separate steam supply, controlled by a valve; so that either one, two, or three retorts of a set may be steamed as desired. Further, between the valve and the retort, a disc is fixed in the steam-pipe having a small hole, about $\frac{3}{16}$ inch diameter, drilled in its centre. Thus the man attending to the steaming always either fully opens or closes the valves—no half-measures being allowed. The gas pressures at the bottom of the retorts have been ascertained from time to time; and a typical chart is reproduced. The usual practice has been to work with the dips unsealed, sealing-off only during charging; the retort-house governor



PRESSURE AT BOTTOM OF DESSAU VERTICAL RETORTS—TWELVE-HOUR CHARGES.

being set to level gauge at the inlet. The average temperature in the combustion chambers at the maximum heat zone, taken by means of a Fèry spiral pyrometer, is 1100° C. The average temperature of the retorts taken immediately after the charge is dropped has been found to be: Lower portion, 1000° C.; middle portion, 900° C.; top portion, 800° C. The average composition of the waste gases (samples taken at the lowest sight hole, immediately over the furnace side of the damper) is: Carbon dioxide, 18·0 per cent.; carbon monoxide, 0·3 per cent.; oxygen, 0·8 per cent. The draught at the same point is kept between 8 and 9 mm.; the setting of the primary and secondary air slides not being interfered with, unless some change in the working conditions necessitates doing so. Complete control is easily maintained over the heats. The settings are sensitive, and quickly respond to any changes made.

The coal used throughout the period of which the working results are given was South Yorkshire Silkstone—a mixture of "unscreened" and "cobbles" in about equal proportions. It should be noted that, during the first three or four weeks over which these figures have been obtained, coal was being used that had been in stock in the open yard over the whole of the winter months—a position brought about by preparations for the coal strike—and was therefore saturated with moisture. For a further period, coal was used that had been in stock nearly two years. Samples of the coal as received were taken, and screened through a sieve having a ¼-inch mesh, the average result being that 20 per cent. passed through the ¼-inch mesh. Samples of the same consignment, after breaking and elevating—that is, as stored in the overhead hoppers ready for use—were treated in a similar manner; and the amount passing through the ¼-inch mesh was found to be 23 per cent. The approximate analysis of the coal is: Moisture, 4·20 per cent; volatile matter, 25·67 per cent.; total residue, 74·33 per cent.; ash, 6·02 per cent.; sulphur (separate estimation), 4·16 per cent.

The working results for the nine weeks ended April 19 are as follows:

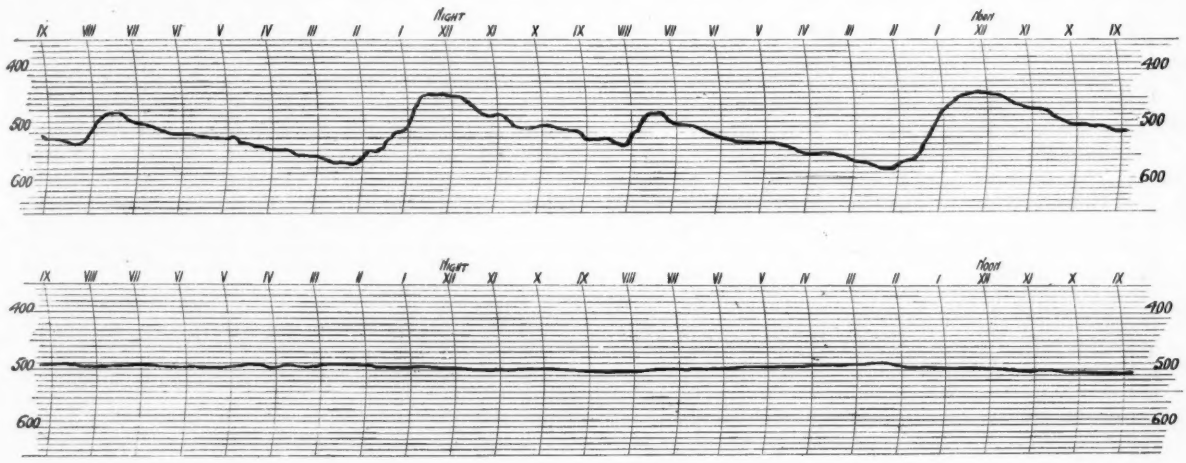
Coal carbonized	3,891 tons
Gas made (corrected to 60° Fahr. and 30-inch bar.)	54,292,020 cubic feet
Gas made per ton, corrected	13,953 cubic feet
Average illuminating power (No. 2 "Metropolitan")	14·90 S.S.C.
Average calorific value, gross	542 B.Th.U.
Average calorific value, net	490 B.Th.U.
Candles per ton	41,579
B.Th.U. per ton	7,562,526
Sperm value in lbs. per ton	713
Sulphur in purified gas, in grains per 100 cubic feet (oxide only used)	28·3
Ammonia in purified gas, grains per 100 cubic feet	0·23
Naphthalene in purified gas	trace only

The average composition of the purified gas was:

	Per Cent.		Per Cent.
Carbon dioxide	1·9	Methane	28·96
Heavy hydrocarbons	3·3	Hydrogen	50·18
Oxygen	0·4	Nitrogen	5·36
Carbon monoxide	9·9		

The percentage of air admitted at the inlet of the condensers, for purification purposes, has throughout the whole of the period referred to not exceeded 2 per cent. The average temperature of the gas leaving the retorts taken at the gas off-take pipes is 320° C., and taken at the outlet of the hydraulic mains 90° C.

Typical charts, taken by a continuous recording calorimeter of the Beasley type, showing the net calorific value of the gas, are



DESSAU VERTICAL RETORTS AT EAST HULL—NET CALORIFIC VALUE CHARTS.

reproduced: (1) Gas being made. (2) Gas as sent out when working into and out of the same holder; the inlet and outlet pipes being placed side by side.

The coke from these verticals is somewhat denser than that made in horizontals using the same coal. But this has not been found to detract from local sales; the size passing over a screen having a mesh of 1¼ inches diameter and through a screen of 1¾ inches mesh is very suitable, and finds a ready sale for domestic purposes.

Analyses of average samples of both are given below:

	Vertical.	Horizontal.
Sulphur	1·39 Per cent.	1·16 Per cent.
Ash	9·81 ,,	9·70 ,,
Moisture	1·00 ,,	1·00 ,,
Calorific power	12,106 B.Th.U.	12,045 B.Th.U.

The coke and breeze made per ton is: That passing through 1¼-inch mesh screen, 1·39 cwt.; through 1¾-inch mesh screen, 2·73 cwt.; over 1¾-inch mesh screen, 10·60 cwt. The coke used for fuel, calculated on the dry basis, is 16 per cent., when working 12-hour charges and steaming the last two hours of each charge.

Under the existing conditions, it has not been possible, up to the time of writing, to obtain with any degree of accuracy the quantity of tar or sulphate of ammonia made. A laboratory distillation of the tar indicates:

Specific gravity	1·096
Light oils up to 170° C.	1·64 per cent. by volume
Middle oils, 170° to 270° C.	23·36 ,, ,,
Heavy oils, 270° to 350° C.	20·20 ,, ,,
Pitch and free carbon	54·80 ,, ,,

A quantity of pitch is deposited in the hydraulic mains; and to collect this, movable pitch-pans are introduced—being emptied from time to time as necessary. The amount of pitch collected is 4½ cwt. per week per bed; being equal to 5 lbs. per ton of coal carbonized. This is disposed of by breaking it up and throwing it into the retorts after they have been charged.

The whole plant has since the commencement worked satisfactorily, and without trouble. Messrs. Leech, Goodall, and Co. were the Contractors—being primarily responsible for the complete installation, excepting the various foundations and underground work, which were carried out by local contractors.

[The remarks by members of the Association, when proposing a vote of thanks to the author for his paper, are given on p. 357 of to-day's issue.]

An Optical Convention.—About eighteen months ago, a movement was set on foot for holding an Optical Convention in London during the present year. The arrangements have now been completed, and the convention will be held, in conjunction with an exhibition of optical and allied instruments, in the buildings of the Science Museum, South Kensington, from the 19th to the 26th of June. The Organizing Committee is under the general presidency of Professor Silvanus P. Thompson, F.R.S.; and the Executive Committee has for Chairman Dr. R. Mullineux Walmsley, F.R.S.E., and for Secretary Mr. Walter T. Dunn.

Rusting of Painted Ironwork.—In the "Chemical Trade Journal" some weeks ago, attention was called to a paper by Herren Liebreich and Spitzer in which the authors arrived at the remarkable conclusion that two coats of paint afford less protection to ironwork than does a single coat, and that every extra coat, at least up to four, is a positive disadvantage. These conclusions rested upon experiments which were described in detail in the original paper; and the author's methods are being subjected to critical examination. We learn from our contemporary that in a recent number of the "Zeitschrift für Electrochemie," Herr K. Arndt suggests that the explanation of the results may perhaps be found to be due to the use of highly polished iron sheets. A coat of paint adheres badly to a highly polished surface, and a thick coat even more badly than a thin one. Herr Arndt suggests that the experiments should be repeated with surfaces which have not been polished, but merely cleaned by sand-blasting.

STEEL OR CONCRETE FOR GASHOLDER TANKS.

In the "JOURNAL" for the 16th ult. (p. 157), we gave an abstract of a paper on "The Suitability of Concrete for Gasholder Tanks," presented by Mr. HERBERT W. ALRICH, a member of the engineering staff of the Consolidated Gas Company of New York, to the eighth annual convention of the National Association of Cement Users of Philadelphia (Pa.). We have since received from the author a print of the paper, and are therefore able to amplify what has already appeared, and reproduce the diagrams by which the text is illustrated.

In its purpose the gasholder represents the common feature of all manufacturing enterprises—it is the receptacle for the storage of the product; but, in their design, gasholders are not resembled by any structure or equipment employed in any other line of industry. A prominent engineering writer has recently said that the modern gasholder is "a magnificent achievement in engineering; and one of the wonders of it is the telescopic feature."

There are three principal parts to a gasholder—the tank, the telescopic sections, or gasholder proper, and the guide-frame. Each of these parts differs from the others in function and in the type of construction. The tank, resting upon the ground, is filled with water up to a level about 15 inches below the top. The gasholder proper consists of the telescopic sections, of which there are five in the case of the largest holders that have been built in America. These sections consist of cylindrical steel shells, concentrically located with relation to each other and to the tank. When the holder contains no gas, these shells are nested together, resting upon the bottom of the tank, and submerged almost completely in the water which the tank contains. (See fig. 1.) The outermost shell is usually about 3 feet less in diameter than the tank; and each succeeding section is about 2 ft. 9 in. less in diameter than the preceding one. All the sections are open at each end, except the innermost one, the upper end of which is enclosed by crown plating, having a spherical form.

The inlet and outlet pipe connections enter the tank through the bottom, pass vertically upwards through the water, and terminate at an elevation above the water and just under the crown of the inner section. When gas is admitted to the holder, it first acts upon the crown, lifting that section gradually out of the water, as shown in fig. 2, until the cup constructed round the lower edge of this shell engages the upper edge of the next outside section. To accomplish this engagement, the upper edge of each outer section is constructed in the form of a continuous annular hook, called the grip, and correspondingly the lower edge of each section, except the outermost one, is formed into a continuous annular cup. Both the grip and the cup are identical in construction, and differ only in this respect—that the grip is inverted to permit interlocking with the cup, as shown in fig. 3. As the inflation of the holder continues, each succeeding section is lifted out of the water, and in turn picks up the next outer section. As each interlocked cup and grip pass upwards out of the tank, there is carried along that quantity of water which is necessary for forming a hydraulic seal against the maximum pressure of the holder. This action continues until the holder is filled to the limit of its capacity, as shown in fig. 4.

While thus ascending, or conversely descending, the sections are maintained in their relative concentric positions by two sets of rollers. First, the rollers spaced equidistant around the lower

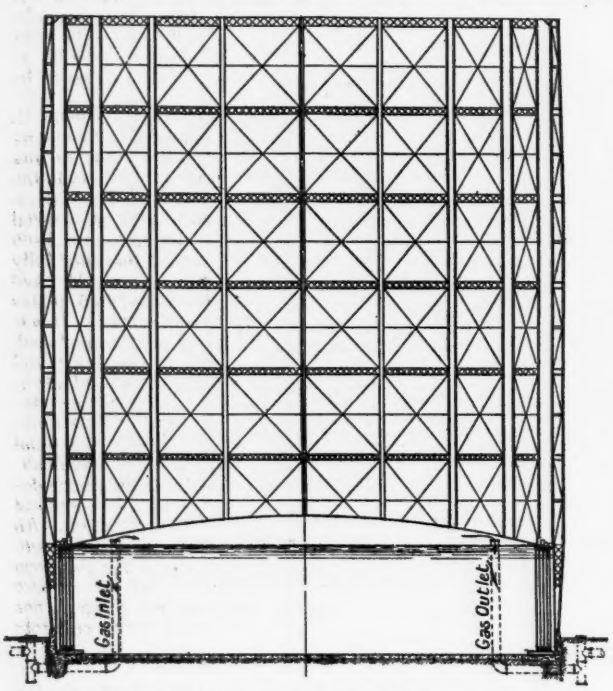


Fig. 1.—Cross Section of a Gasholder Grounded.

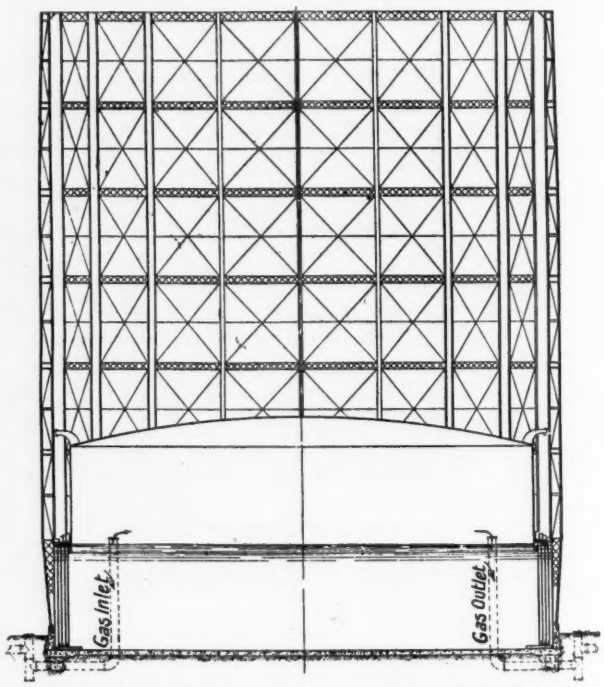


Fig. 2.—Holder Proper just before Engaging an Additional Lift.

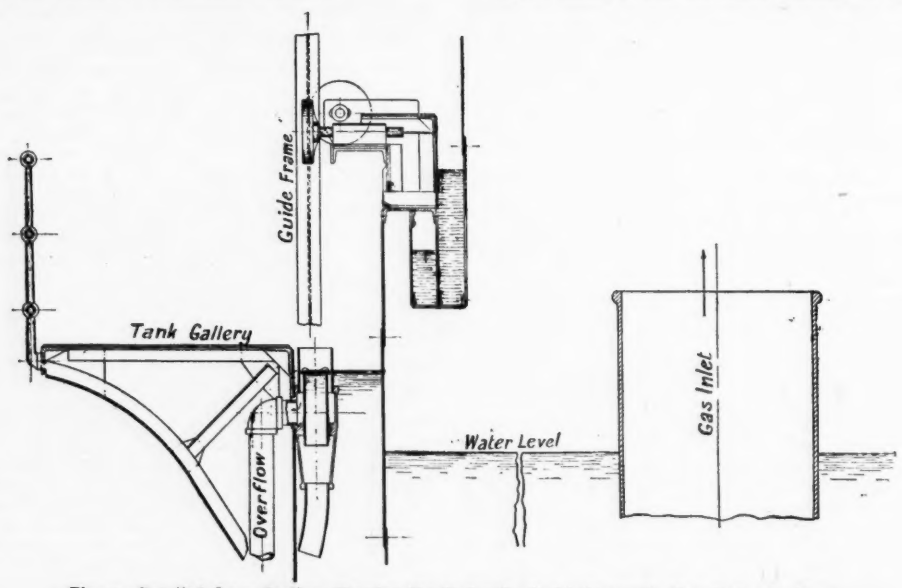


Fig. 3.—Detailed Cross Section, Showing the Hydraulic Seal between the Two Outer Sections.

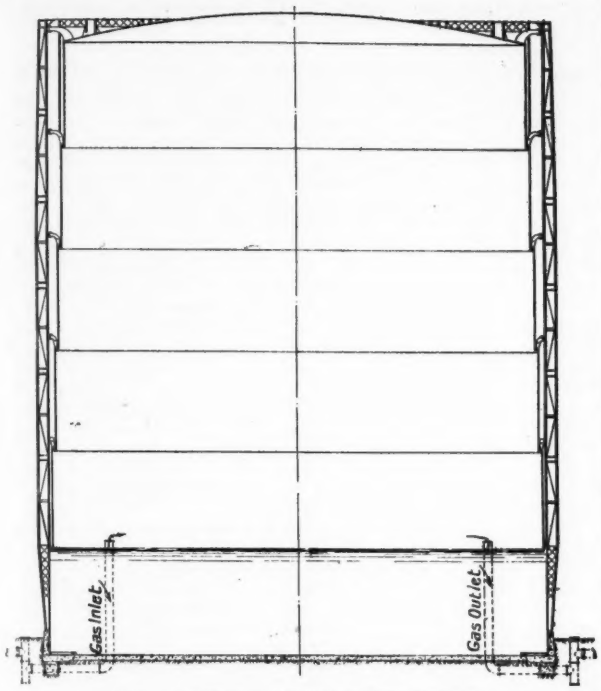


Fig. 4.—Section of the Holder Fully Inflated.

edges of the shells; and, second, the rollers mounted on brackets attached to the upper edges of the shells. The first set are known as the internal rollers, and travel upon vertical guides, located on the inner surface of the tank and also on the inner surface of each shell, except that of the innermost section. The other set of rollers travel upon the guide-rails, which are carried by the guide-framing, which consists of vertical columns spaced equidistant, and about 30 feet apart around the circumference of the tank. These columns are connected by horizontal and diagonal cross-bracing. The frame is carried to such a height as will provide guidance for the inner section in its maximum upward travel. It will be apparent from what has been said that the enormous pressure of the wind against the inflated sections is ultimately transmitted by the guide-framing to the tank.

Selection of Materials.

In the selection of materials in manufacturing, we are subject to an inexorable law of suitability. In producing any manufacture, there will be ultimately employed that material which possesses preponderant advantage. The use of any other cannot long be sustained. From the very beginning of the gas industry, a hundred years ago, the guide-frames and holder sections have been built exclusively of iron or steel. It does not appear that any attempt was ever made to use any other materials. In the construction of the tanks, however, many different materials and combinations of materials have been employed. It is true that in America until recent years, all holder tanks were built either of brick or stone; but in England (the birthplace of the gas industry) there were constructed tanks of almost every conceivable type—many of the designs being more fanciful than practical. It was inevitable that those constructions without merit should disappear until the prevailing practice, throughout the world, during the last twenty years, may be stated as limited to steel tanks placed upon the ground, and brick or concrete tanks located below the ground. During the last ten years, the preponderance of advantage in America has been in favour of steel tanks for all holders, large or small. In England, though concrete tanks had been constructed as far back as the year 1870, the practice of the last decade has been quite uniformly to build small tanks of steel, and large tanks of brick—there being but few instances of concrete construction. In Continental Europe, the practice for a decade has followed the English, with the exception that during the last three or four years there has been a marked tendency towards the exclusive employment of steel, though a few concrete tanks of small size have also been constructed.

The competitive, economic, and geological conditions existing in England all favour the brick tank for large holders. While the population of Great Britain is somewhat less than that of the United States, the number of concerns engaged in holder construction is very much greater—in fact, the building of the largest holders in America is confined to a very few companies having special qualifications and known responsibility. Hence the commercial conditions prevailing have enabled these firms to develop extensive equipments, which have wonderfully facilitated the construction of steel tanks. When selecting sites for large holders in England, they appear to have generally encountered formations of clay possessing remarkable stability. This has permitted them to construct economical tanks by lining a cylindrical excavation in the clay with brick walls, which are thinner than American geological conditions will generally permit. Unskilled labour is relatively very cheap in England; and in some cases the cost of construction has been partly defrayed by the commercial value of the excavated clay. In the case of the 10 million cubic feet holder erected at Manchester in 1909 and 1910, the bricks for the tank walls were manufactured upon the site from the excavated clay. It is a fact, however, that the time required for the construction of this particular holder would be regarded as economically impossible in the United States. The result of all these conditions has been that the English gasholder builders have not developed the special equipment required for the construction of very large steel tanks, nor does it appear that the steel plants produce plates suitable for the purpose.

American Conditions.

To confine the subject now to American conditions, the controlling requirements in the design of a gasholder are: Structural stability, economy, rapidity of construction, and durability. Certain physical phenomena having to do with the distribution of gas require the holders to be located upon the lowest available ground. In America, such sites rarely consist of a very stable geological formation, and are frequently reclaimed land. Hence, if under the usual conditions there be undertaken the building of an underground masonry tank, there will probably be encountered such difficulties as to greatly enhance the cost of the work and prolong the period of construction. If it should be suggested that a concrete tank might be built above the ground, a moment's reflection upon its relation to the guide-framing will be sufficient to dispose of the proposition.

During the last eight years, the writer has participated in the design and construction of the three largest concrete gasholder tanks in the world. Two of these tanks are 300 feet in diameter by 48 ft. 3 in. deep; while the third is 189 feet in diameter and 41 ft. 6 in. deep—all inside dimensions. In referring to them, he wishes to be understood as speaking for himself alone. The work on these three tanks proceeded in such simultaneous relation as permitted any improvement in methods developed on one to be employed to advantage on another.

At the time the tanks were being designed, Mr. William H. Bradley, the Chief Engineer of the Consolidated Gas Company of New York, made a thorough inquiry as to the design of any other concrete tanks that had been constructed anywhere in the world; and there was found little precedent to consider. As regards the two 300-feet tanks, the undertaking was one of unusual magnitude, for the holders were the largest that have ever been built. The possibilities of nickel steel were not at that time fully understood; hence the construction of steel tanks would have been unthinkable, as there would have been required plates 4 inches thick, connected by rivets 3 inches in diameter. It was evident that masonry construction of some kind must be employed. A number of different designs were worked out, analyzed, and compared, resulting in the conclusion that the most advantageous construction would be a plain annular wall of reinforced concrete; and all three tanks were thus built. The work upon all three tanks was accomplished with entire success. While there were special conditions, the controlling factors in these instances, and determining the selection of concrete construction, the writer concludes that steel is far preferable, as a general proposition. The smallest of these three tanks required a full year for its construction. An entire holder of the same size having a steel tank can be constructed in seven months, without special effort. It has also been demonstrated to the satisfaction of the writer that in no case where a steel tank is at all possible will the cost reach 70 per cent. of the outlay that is required for a corresponding concrete construction.

Steel or Concrete for Tanks.

The question as to whether steel or concrete tanks are the more durable must be settled in another generation; but the writer believes that the steel tanks are the more expedient. He has knowledge of several brick tanks having been seriously damaged by blasting in their vicinity. From his knowledge of other concrete structures having been badly cracked in a similar way, he must conclude that concrete tanks are not immune from the hazard. The durability of concrete tanks is also open to question, in view of the peculiar behaviour of concrete observed by the writer in the instance of two of the most prominent engineering undertakings in the United States, in which cases, several years after the concrete had set, masses of it became soft and pulpy, requiring replacement. A holder tank is not such a structure as one upon which such repairs can be easily made; but it is one of such importance as to forbid speculative constructions.

The writer has examined and reported upon a large number of steel tanks, some of which had been in service for upwards of twenty years. While these older tanks are doubtless constructed of a steel far inferior to that which is now produced, all these tanks, with one exception, could survive the youngest man now engaged in the gas business. It has sometimes been urged against the durability of steel tanks that all favourable conclusions had been formed from exterior examinations. The writer has had the opportunity of examining internally some of the oldest steel tanks in existence; and he concludes that, excepting at the water-line, there is no perceptible deterioration. In one case, the holder had been employed for twelve years, in connection with a process of gas manufacture now obsolete. As a part of this process, a non luminous gas containing some sulphur was stored in this holder, which resulted in the sulphur being absorbed by the water in the tank; but the writer found the interior only very slightly pitted.

The writer stated it as his conviction that, while not possessing a single element of advantage over steel tanks, concrete tanks are subject to several disadvantages which he enumerated. He also specified the distinct advantages, in his opinion, of steel tanks. These comparisons were given in the abstract of the paper which has already appeared in our pages.

The disadvantages of concrete and the advantages of steel tanks might be separately extended and elaborated; but the writer will confine himself to the two advantages of the latter class of tanks—that they require a shorter period for their construction and that their manufacture and erection have reached a high state of development. The bottom of a steel tank, excepting an outer course, consists of rectangular steel plates, generally about ⅜-inch thick, connected by single riveted lap-joints. The outer course consists of heavy segmental plates, which conform the bottom to the circle. Riveted around the outer edge of this outer course is the bottom curb, which, in the case of a large tank, will be an 8 in. by 8 in. by 1⅛ in. angle. The bottom course of curved plates, forming the shell of the tank, is riveted to the upstanding leg of this curb angle. The next course of plating is then attached to the lowest course by a single riveted lap joint running horizontally around the tank circumference. The other courses are connected in like manner; the entire number in the height of the tank usually being about eight or nine. It is necessary for the vertical joints, which occur about 30 feet apart around the circumference, to be spliced in a manner capable of resisting the full circumferential tension. To accomplish this, the joints are covered by double butt straps; each splice being quadruple riveted with double shear and triple riveted with single shear rivets. The total number of rivets in the cylindrical shell of the tank alone may be as many as 25,000.

After the bottom of the tank has been completed, a vertical steel post is erected at its geometric centre. A circular rail is also laid concentrically upon the tank bottom. Mounted upon trunnions upon the top of the central steel posts are two radial traveller arms, the outer ends of which are supported by legs having wheels running upon the circular rail. These radial travellers are equipped with such suitable attachments as will permit one of them being used to assemble the curved plates while the other supports the hydraulic-pneumatic riveting-machine. Thus, as one traveller proceeds around the circumference lifting the plates into position, it is followed by the other with the riveter. Quite obviously, the first traveller is able to keep well ahead of the riveting, which permits that traveller to participate in the simultaneous erection of the five holder shells. When the tank and the holder sections have been completed, the tall centre post around which the travellers revolve is replaced by a much shorter one, resting upon the centre of the crown. While the outer leg of one of the travellers has its lower section removed, and thus shortened, it travels upon a circular rail which has been attached to the completed crown. The other radial traveller is entirely removed. After water has been placed in the tank, the holder is gradually inflated with air, and as it rises the remaining radial traveller moves around the circumference, erecting the guide-framing successively in tiers. It requires but little reflection to perceive that if the holder is to be provided with a concrete tank, any such co-ordination is impossible. As to the time required, it may be stated that in the instance of the largest steel tanks ever built, which were 251 ft. 3 in. in diameter, the lower courses of which consisted of 2 $\frac{5}{16}$ inch plates, and having 26 double butt joints in each course, the tanks were erected and riveted complete at the rate of 32 hours per course. One of these holders was entirely completed in seven and a half months. If there is a method of concrete tank construction which would have permitted the completion of such a holder in two years, it has not yet been found.

In conclusion, the writer will condense into a few words his opinion on the matter as stated in another discussion: "He may be charged with entertaining a strong prejudice against masonry tanks. He will admit that he is opposed to any type of tank of which from 25 to 40 per cent. of the cost may go into digging a hole in the ground instead of putting quality into the structure." To this he would add his conviction that a site which forbids a steel tank is not the place to put a gasholder.

Manchester District Institution.—We learn from Mr. W. Whatmough, of Heywood, the Hon. Secretary, that the next quarterly meeting of the Institution will be held at Oldham on Saturday, the 18th inst., when the members will inspect the new spiral-guided holder of 5¼ millions capacity, and Mr. Tim Duxbury, the Engineer, will contribute a paper on "Spirally-Guided Gasholders at Oldham." The members will meet at the Hollinwood works, and proceed by special car to the Town Hall, where the business will be transacted.

Wales and Monmouthshire District Institution.—As already announced, the meeting of the Institution will take place on Thursday of this week at Pontypridd, under the presidency of Mr. E. H. Swain. In addition to the formal business and the consideration of the draft scheme for the education and certification of gas-fitters, two papers will be submitted—one on "Gas Testing for Small Works," by Mr. Evan Rees, of Blaina, and the other on "Furnace Control," by Mr. H. D. Madden, of Cardiff. After the meeting, the members will lunch at the Park Hotel as guests of the President; and subsequently the gas-works and electricity generating and tramways station will be inspected.

CORROSION OF METALS IN PURIFIER-HOUSES.

On the occasion of the last meeting of the New England Association of Gas Engineers, the "Question Box" contained the following: "Riveted steel main-pipe placed between the condensers and the rotary outlet, and again forming the main inlet line in the purifier-house, having been in use three years, suddenly develops signs of pinholes, which later on grow to such an extent as to necessitate a change to cast-iron pipe. The wasting-away of the steel metal occurs from the inside towards the outer surface. Has anyone experienced similar troubles with steel pipes, and was the cause and remedy found?" Mr. Kennedy said he was responsible for the long question; and he had asked the Chemist of the Cambridge (Mass.) Gas Company (Mr. J. T. Haddock) to inquire into the matter. It had been suggested that the cause might be electrolysis discharging from the metal of the pipe into the liquor within it, and so dissipating itself into the seal-pots. There had not been any depreciation of the purifier-box worth mentioning; but the steel pipe, which was ⅜-inch thick, was eaten through within 3½ years. In one length taken out last autumn, the inside of the pipe could be removed in laminations like slate or mica. They did not know whether it was due to the metal or to the kind of gas that they were making. Mr. Haddock's report was as follows.

The inlet steel pipe to the purifying-boxes, the iron beams, and the tie-rods are eaten so that they must be renewed. When the plate on the end of the inlet main was removed, it was noticeable that the deposit was much deeper in the sections of steel pipe than in those of cast-iron pipe, and the sludge in this pipe was very soft and slimy compared with that found in the steel pipe. This was due to the more rapid action on the steel than on the cast iron. The following analysis shows that the sludge taken from the steel pipe had much more iron in it.

	Steel Pipe. Per Cent.	Cast-Iron Pipe. Per Cent.
Moisture	19·0	28·8
Iron oxide	53·0	23·0
Sulphur	14·6	7·6
Cyanogen	1·6	0·6
Ammonia	6·3	5·9
Carbon	8·4	5·5
Carbon dioxide	1·2	1·5

In the sludge from the cast-iron pipe there was a large amount of light oil and naphthalene.

The presence of carbon with the impurities—such as cyanogen 108 grains, sulphuretted hydrogen 300 grains, sulphur compounds 20 grains, 1½ per cent. of carbon dioxide, and traces of ammonia—starts small galvanic cells, and the metal begins to pit. As the iron changes into the various compounds, it acts like sponge, and the area of corrosion increases in size.

Two years ago we found the top of the tubes in our primary condenser coated with the same sludge, and at this point the tubes were eaten so that they had to be renewed. The lower part of them seemed to be in good condition, as there was enough condensation on them to allow of the carbon being continually washed off. When the new tubes were put in, a baffle-plate was placed in the inlet end of the condenser, so that all the gas had to go to the top of the tubes and condense there. We find on examining these new tubes, after having been in use longer than were the first, that there is no hard deposit on the top. Some action is going on; but it is evenly distributed over the tubes.

I put strips of different metals in the sludge taken from the cast-iron pipe for six days, at a temperature of 120° Fahr. Steel lost 13 per cent. of its weight; American ingot iron, 3·1 per cent.; cast iron, 2·3 per cent.; and Toncan metal, 6·2 per cent. This shows that, if a metal cannot be protected, cast iron should be used; the slower action and the extra stock give it a longer life. These metals were placed in a number of solutions for the same length of time, and corrosion took place in most of them; when carbon was added, the action was usually increased.

	Steel.	Ingot Iron.	Cast Iron.	Toncan Metal.
Ammoniacal liquor	—	0·70	—	0·46
Do., and Cabot's lampblack	0·15	—	0·35	5·75
Do., and carbon from tar	—	—	0·34	3·89
Potassium sulphocyanide	0·14	—	—	—
Ammonium sulphocyanide	0·79	2·80	—	—
Ammonium and naphthalene	1·06	—	—	—
Boiled in ammonium sulphocyanide three minutes	0·19	—	—	—
Ammoniacal sulphocyanide and carbon from tar	0·59	—	0·59	2·52
Ammoniacal liquor and coke	0·16	0·12	0·10	1·30
Ammonium sulphocyanide and coke	1·50	2·59	0·21	1·06
Potassium cyanide	0·02	—	—	—
Do., and carbon from tar	0·03	—	—	—
Do., and coke	0·20	—	—	—

If you take some of the sludge and test it with a piece of iron as one terminal and a piece of carbon as the other, you get a current. The sludge from the secondary condensers will not give a current, as it contains enough tar and oil to be a non-conductor. The tubes in these condensers have given us no trouble as yet, and have been in constant service since the apparatus was installed.

I treated a piece of steel and a piece of American ingot iron with Bakelite, and heated it to 250° Fahr. for ten minutes. These pieces were kept for six days in the sludge taken from the cast-iron pipe. No corrosion took place—in fact, they gained 0·03 per

cent. and 0·06 per cent., due to the small particles of sludge which stuck to the uneven coating. The coating was not so smooth as we could wish, owing to haste and inexperience in preparation. Since that time we have given 10-feet bars a coat which was very smooth. Another coated piece was boiled for ten minutes in ammoniacal liquor, and showed no loss in weight, as it was placed in the inlet steam-pipe to a pump which was running for three hours, and here it showed no change. I would recommend it as a protective coating for heater tubes and brass valves and cocks that come in contact with chemicals, especially ammonia. Two objections to its use are that it gives a brittle coat and it must be heated to 238° Fahr. before it has these resisting qualities. In some of our boxes we have had to renew the iron bars. The last time we treated these boxes with this vapour, which is an insulating material, and which after it has been heated to 250° Fahr. seems to resist the action of practically all chemicals; and we are going to try it further to see if we can save a little iron.

TREATING THE LIQUEFIED PRODUCTS FROM NATURAL GAS.

The properties and uses of the liquefied products from natural gas are dealt with by Messrs. I. C. Allen and G. A. Burrell in the course of a paper that was lately issued by the United States Bureau of Mines.

The authors try to show how natural gas, much of which is escaping without restraint in almost all the petroleum fields of the country, may be conserved. In outlining this, they declare that by fractionating natural gas, either during or after liquefaction, four products are commercially obtained, which products may be roughly described as follows: (1) The gaseous product, or the common natural gas of commerce; (2) the semi-liquid product, known as the new "wild" product, which should be used only as a liquefied gas, and should be held only in high-pressure steel containers; (3) the light liquid product, or gasoline, used for blending with heavy naphthas; and (4) the heavy liquid product, or ordinary high-grade gasoline. The possibility of handling the second product, after the manner of Pintsch and Blau gases—enabling small towns, hotels, and country estates to have the advantage of gas illumination—opens a new field of comparatively great importance in the natural-gas industry.

It is admitted that the liquefaction of gases by pressure is not a new industry; but it is only recently that its application to natural gas has been recognized as practicable. Up to the last two years, the general practice in the manufacture of liquid natural gas was to make the product by compression in single-stage vehicles, operated at a pressure of from 150 to 300 lbs. per square inch. The one product obtained—the so-called "natural gasoline"—was run into a tank and "weathered." The latter consists in allowing the lighter portions to volatilize spontaneously, and escape into the open air until such time as the boiling away of the liquid practically ceased. Thus the process involved an absolute loss or waste of 25 to 50 per cent., or even more, of power and of the cost of operating the engines and compressors, and of the product itself. The next step in the industry was to pass the waste gases (of which only the small quantity used for power had been utilized) from the single-stage through a higher-stage compressor; thereby getting a second and more volatile product (a "wilder" liquid), which was run back and mixed with the first or heavier condensate. This mixture was again weathered to a safe degree, whereby it lost the greater part of the more volatile product condensed in the second stage.

Recently the process was improved another step, in that the first-stage compressor product is run into one tank and handled as ordinary gasoline; the second compressor product being run into a second tank, and handled as a lighter gasoline, with which the heavy refinery naphthas can be enriched or enlivened. The last-mentioned method of using the second-stage compressor product should receive wide recognition, and a market for the product should develop that would be no mean factor in the industry. Blending in the proportion of one part of the product to four or five parts of the refinery naphthas increases the volatility of the heavy naphthas, and also their general usefulness. The proportions to be used in blending, however, must be determined more definitely by test.

The natural gas of America frequently contains light products that do not condense in the second-stage compressor; and for these it is practicable and necessary to instal three, four, and even higher stage compressors. These light products—true gases at ordinary temperatures and pressures—can be compressed and liquefied; but the liquid gases so obtained must be handled as gases, not as oils.

The mistake heretofore made in the "natural-gas gasoline" industry, as some have recognized, has been the attempt to handle the light gaseous products as oils, and not as gases. Until the manufacturers of this lightest third or fourth stage compressor product recognize its gaseous nature, the absolute necessity for ensuring the safety of the public involves certain restrictions in regard to its transportation. Therefore, not until the fact that this extremely volatile liquid should be handled only in strong steel containers capable of withstanding high pressures is recognized, will it be transported with safety.

CIRCULAR REINFORCED CONCRETE RESERVOIRS.

For some years, Mr. Alexander Potter, of New York, has been making frequent use of circular reinforced concrete reservoirs; and at the last meeting of the New England Water-Works Association he explained at some length the reasons which led him to look with such favour on this type of design. According to "Engineering Record," he regards as one of its leading advantages over any other form the ability to enlarge its capacity economically by simply increasing its depth. This enables the designer to keep down the first cost by building a reservoir of sufficient size for immediate needs. As the consumption grows, the capacity can be increased; and raising the water level will at the same time counteract the greater frictional losses in the distribution system due to augmented consumption.

In a large circular reinforced concrete tank, Mr. Potter said, it was necessary to keep in mind the varying tension from point to point in the steel reinforcement, due to the difficulty of obtaining a true circle in the field. A variation of $\frac{1}{2}$ inch in the middle ordinate of a 10-feet chord in a tank 25 feet in diameter will correspond to a range in tension in the reinforcement of 12,860 to 16,200 lbs., provided the average tension is taken at 14,000 lbs. With a 75-feet tank, a similar variation in the ordinate will cause a range of 5910 to 21,100 lbs. in tension. This emphasizes the danger caused by carelessness in constructing a circular reservoir more than 100 feet in diameter.

Mr. Potter's experience leads him to limit the working tension in the steel reinforcement to 14,000 lbs. per square inch in a small tank, and to 12,000 lbs. in comparatively large tanks. The variation in the tension of the steel reinforcement from point to point, due to the varying curvature of the shell, makes, in his opinion, the use of a reinforcing bar with mechanical bond advisable. He prefers a high-carbon steel with an elastic limit of 50,000 lbs.

Another difficulty in the design to which Mr. Potter drew attention is the tendency to rupture along the line between the inside wall of the reservoir and the base, due to the expansion of the walls by internal water pressure, and their consequent drawing away, as it were, from the base of the tank.

The value of the circular form when a reservoir must have its capacity increased was explained by Mr. Potter by referring to work done at Suffern (N.Y.), which had a circular tank 70 feet in diameter and 10 ft. 6 in. deep sunk entirely into the ground. The walls were 2 feet in thickness, and both bottom and sides were constructed of plain concrete. It had storage capacity of 266,000 gallons, which had to be doubled. The old structure, although massive, nevertheless leaked considerably, more especially in the bottom. It was, therefore, decided to line the bottom at the same time that the sides were being raised.

The reservoir as remodelled has an inside diameter of 69 feet, and holds approximately 20 feet of water—giving a storage of 659,000 gallons. The old side walls are lined on the inside with 6 inches of reinforced concrete. Above the old work the width of the new work is 12 inches, tapering to 8 inches at the top. The circumferential reinforcement consists of $\frac{5}{8}$-inch square corrugated bars spaced so that the average unit tensile stress in them does not exceed 14,000 lbs. As a result of the work, an increase in storage of 294,000 gallons was obtained at a cost of $2500 (£521). The location of the reservoir on a steep mountain slope about 180 feet above the street level increased the cost of hauling material to the site and also the contract price.

Masonic.

At the annual meeting of the West Yorks Mark Masons Charity Committee, held at Elland last Wednesday, W. Bro. J. W. Broadhead, P.P.O., was elected Chairman; and at the subsequent meeting of Provincial Grand Lodge of Mark Masons, he was installed as Provincial Senior Grand Warden.

It has been already intimated that it was intended to have a Chapter of Royal Arch Masons in connection with the Evening Star Lodge, No. 1719. The Consecration of this Chapter took place at the Freemasons' Hall, Great Queen Street, last Tuesday, and was numerously attended by many very distinguished Royal Arch Masons. E.Comp. Sir Edward Letchworth, F.S.A., Grand Scribe E., efficiently performed the ceremonial, ably assisted by E.Comp. John White, P.G.Std.Br., E.Comp. the V. Rev. Dean Brownrigg, M.A., Grand Superintendent for Bucks, E.Comp. J. S. Granville Grenfell, M.A., Dep.G.D.Cerms., and E.Comp. Lionel F. Dunnett, P.A.G.D.Cerms. The three principal chairs were afterwards filled by E.Comp. W. A. Surridge, M.E.Z.; E.Comp. Charles Meiklejohn, H.; and E.Comp. J. W. Broadhead, J.; and subsequently the other offices were filled as follows: E.Comp. R. W. Foster, Sc.E.; E.Comp. T. H. Adkins, Sc.N.; E.Comp. Walter King, Treasurer; E.Comp. C. D. Lord, P.S.; E.Comp. P. W. Greetham, First A.S.; E.Comp. F. A. West, Second A.S.; E.Comp. William Thomson, Steward; E.Comp. A. E. Eves, Steward. The other Founders of the Lodge were: E.Comp. W. P. Gibbons, E.Comp. Bernard F. Browne, E.Comp. Gordon M. Folkard, E.Comp. J. Ratcliffe Cousins, E.Comp. William Dommett, E.Comp. A. C. Beal, and E.Comp. Samuel Cutler, Jun. The Chapter starts under exceedingly favourable auspices, as at the first regular meeting of the Chapter to be held this (Tuesday) evening there are ten brethren to be balloted for and exalted. The subsequent meetings of the Chapter will be held on the second Wednesday in May and November each year.

"EXCESS LIME" METHOD OF TREATING WATER.

In the last number of the "JOURNAL," brief reference was made to the seventh of the valuable series of research reports by Dr. A. C. Houston, the Director of Water Examination of the Metropolitan Water Board. In a note in the report, he stated that he had found that quicklime (about 75 per cent. CaO), added to raw Thames water in the proportion of one part to 5000 parts of water, killed the *bacillus coli* in from 5 to 24 hours under laboratory conditions of experiment; but he promised that the considerations arising out of this discovery should be dealt with in his next report. This has now been issued.

At the outset, Dr. Houston sets forth the circumstances which led to the preparation of the report. He shows that while the consumption of water has increased, the same sources of river supply are depended upon. He remarks that reports and experience in the past have shown that, as a matter of fact, some of the intakes are seldom or never closed, and that flood water loaded with suspended matter, "rich in organic matter and swarming with bacteria," is frequently pumped into the storage reservoirs. It may be, and Dr. Houston thinks it is, true that adequate storage, even of highly impure water, destroys all, or practically all, the microbes of water-borne diseases. At the same time he points out that storage succeeds only partially in removing colour and oxidizable matter. In any case, he says he is "quite unable to support the view that the safety conferred by storage affords a sufficient pretext for the ill-considered abstraction of river water of most undesirable quality." In his reports to the Board, he has repeatedly urged that this specially impure water should either be "excluded from the storage reservoirs or purified antecedently." Dr. Houston then proceeds to describe a novel method of using lime primarily as a germicidal agent, and only secondarily and incidentally for softening purposes; his remarks being as follows.

Numerous methods, fostered by recent events, have been carried out as regards the treatment of flood water; and the results of some of these investigations were dealt with in my seventh research report. I am now able to state that a stage has been reached which, while it does not, perhaps, justify any specific recommendations being made, yet permits of my giving an impartial account of a singularly simple and apparently perfect method (apart from questions of cost, and as judged by laboratory standards) of overcoming all vitally important difficulties in connection with the purity of the Metropolitan Water Supply. The method referred to depends on the discovery of a new way of using lime (the "excess lime" method), so as to obtain not only the softening and mechanical precipitating effects hitherto associated with the use of this substance, but also the sterilization of the major portion of whatever total volume of water is being dealt with.

When 1 part of quicklime (about 75 per cent. CaO) is added to 5000 parts of raw Thames water about 0·007 per cent. free CaO is left in the mixture, and this excess is sufficient to kill *B. coli* in from 5 to 24 hours. To neutralize the excess CaO, not less than 25 per cent. of untreated water must subsequently be added, The greater the temporary hardness of the water, the larger obviously is the proportion of the whole which can be sterilized by this method. In all cases, the proportion which cannot be sterilized is the amount which is required to neutralize the 0·007 per cent. of CaO. Less than 0·007 per cent. is actually needed for bactericidal purposes (24 hours' contact); but in matters of this kind a margin of security should be allowed for.

In the ordinary lime softening process, the procedure, of course, is quite different. Quicklime or slaked lime is added to the total bulk of the water to be softened, and in amount purposely calculated to be rather less than is needed to combine with the bicarbonates present —*i.e.*, just short of removing the whole of the temporary hardness. If, on testing with phenol phthalein or silver nitrate solution, a pink or brown colour develops with these two tests respectively, this indicates an excess of lime, which is always to be carefully avoided. When such an event happens, the dose of lime has either to be at once reduced or carbonic acid pumped into the water, to combine with the excess of free lime. Apart from the fact that the excess lime rehardens the water, it is not desirable to give the consumer lime-water to drink.

In short, in practice, the utmost care has been wittingly or unwittingly exercised so to arrange the process as to prevent any true bactericidal action taking place by accurately treating the whole of the water to be softened with less than the amount of lime required to combine with the bicarbonates so as to form the insoluble and bacteriologically inert carbonate of lime. In the method now under consideration, part of the water is purposely overdosed with lime so as to bring about a known bactericidal effect, and then, after a suitable interval, this is mixed with enough "untreated" water to combine with the excess of lime.

Having considered in great detail the subject-matter of the report—dealing successively with health considerations, questions of taste, and the arguments against hard water—Dr. Houston begins his summary by assuming that it is required to deal with 10,000 gallons of Thames water to remove at least 15 parts of total hardness, and render the water innocuous. He says:

Fifteen pounds of quicklime, costing 1½d., would be added to 7500 gallons of raw unstored Thames water. This would kill within 24 hours the *B. coli*, and inferentially, but certainly, the microbes also of epidemic water-borne disease—*e.g.*, the typhoid bacillus. The water would also be improved considerably, as judged by physical and chemical standards. The excess of lime (about 0·007 per cent.) would then have to be neutralized with 2500 gallons of adequately stored water, which, according to all my experiments, would not contain any of the microbes of epidemic water-borne disease. Thus 75 per cent. of the water would be sterilized chemically, and the remaining 25 per cent. by Nature's own method of sterilization—storage. The mixture would have lost about 15 parts of its total hardness, and would contain no undesirable excess of free lime, besides being perfectly innocuous. Rapid filtration alone would then be required to remove the precipitate of inert carbonate of lime, and to bring the water up to a reasonable standard of chemical purity. If a less reduction of hardness were considered sufficient (say 10 instead of 15 parts), the figures 15 lbs., 1½d., 7500 gallons, and 2500 gallons would then become 10 lbs., 1d., 5000 gallons, and 5000 gallons respectively.

Dealing with the disadvantages of the "excess lime" method, grafted on to an existing water-purifying plant, Dr. Houston admits that they are many and serious. The mere cost of lime to reduce the hardness even by 10 parts would, he says, be about double the cost of the existing process of sand filtration. The capital expenditure on the machinery and softening-tanks would be very large, and the periodical removal and disposal of the sludge from the tanks would entail not only great expense, but might even be impracticable on a large scale. The existing sand filters might or might not be found well suited for removing the last traces of precipitated lime from the water. Though with filtered water the precipitate produced by the addition of lime may settle quite satisfactorily, the reverse is often true when raw river water is dealt with. Dr. Houston says that the difference between raw and filtered river water in this respect is striking, and practically very important. There are, however, many advantages attending the "excess lime" method—among them being its adaptability, its special suitability for flood waters, the saving in soap, the capacity to render quickly an initially foul water absolutely safe, the postponement of the construction of new storage reservoirs, and the raising of the purity of the Metropolitan Water Supply to a pitch of perfection never before attained, if ever seriously contemplated as possible, by any water-works authority in the world dealing with sources of supply comparable with those of London.

In conclusion, Dr. Houston says that if a case has been made out in favour of a reconsideration of the softening problem, it rests mainly on three grounds: (1) The novel method of using lime primarily as a bactericidal agent, and only secondarily and incidentally for softening purposes; (2) the safe and speedy utilization of flood water; and (3) the absolute elimination, so far as the portion of water treated with an excess of lime is concerned, of danger from epidemic water-borne diseases—*e.g.*, typhoid fever and cholera.

Monthly Bulletin of the British Commercial Gas Association.

We have received from the Secretary of the Association a copy of the first issue of the monthly "Bulletin" which the General Committee have arranged to publish for the information, and it is hoped the assistance also, of the members. It is a ten-page pamphlet in an artistic wrapper printed in two colours; a conspicuous feature on the front page being a draped female figure standing upon a column, and holding aloft a gas-lamp, the rays from which are thrown in all directions. In a "Foreword" on the wrapper, the primary object of the Association—viz., to advertise the many uses and advantages of gas—is set forth. The inside page of the wrapper is occupied by lists of the President and Vice-Presidents, the Members of the General and Executive Committees, &c. The first subject taken up is that of the aims and policy of the Association; next come some remarks on local publicity work and how the Association will assist it. A by no means unimportant feature of the "Bulletin" is a chapter on gas publicity from the woman's point of view, in which Mrs. M. A. Cloudsley Brereton, the Association's Editor, offers some useful remarks. Extracts are given from the constitution and rules of the Association in regard to the representation of subscribing gas undertakings, a list being given of those who have so far promised their support. The Association advertise in six London and fifteen Provincial daily papers, and also in fourteen weeklies; and arrangements are being made for securing space in some of the leading magazines, and medical, architectural, and local government journals. We learn that the work of the Association is getting into full swing, and, judging by the number of inquiries received in response to their advertisements, is attracting a great deal of public attention.

The joint visit to the Thorncliffe Iron Works and Coke-Ovens of Messrs. Newton, Chambers, and Co., Limited, by members of the Manchester and District Junior Gas Association and the Yorkshire Junior Gas Association, fixed for next Saturday, has been postponed on account of the disorganization of the train service between Manchester, Leeds, and other places, particularly that between Sheffield and Barnsley. The visit will probably be made next month.

Writing in "Cassier's Magazine" for last month, Mr. J. W. Rogers said that the successful working of centrifugal pumps is generally secured by attention to a few simple precautions, which should be taken with all types of pumps; and though a modern pump will work satisfactorily with a suction lift up to 26 feet, it should be reduced to a minimum, as a short lift enables the suction piping to be maintained practically air-tight without much difficulty. The disadvantage of a high-suction lift is that low-lift pumps are liable to lose their water after being charged; also, the admission of air into a high-lift pump will interrupt the continuity of the flow of water, which will result in a decrease in the efficiency, and in some cases cause vibration in the pump.

REGISTER OF PATENTS.

Gas Valves or Taps.

GREEN, J. W., and DEAKIN, J. L., of Birmingham.

No. 5338; March 3, 1911.

This invention refers to the class of gas-fittings in which the gas-delivery pipe is connected to the valve, so that upon rotation of the pipe the valve is either opened or closed as required—one port in the valve registering with a port in the casing surrounding the valve when it is desired to open the valve.

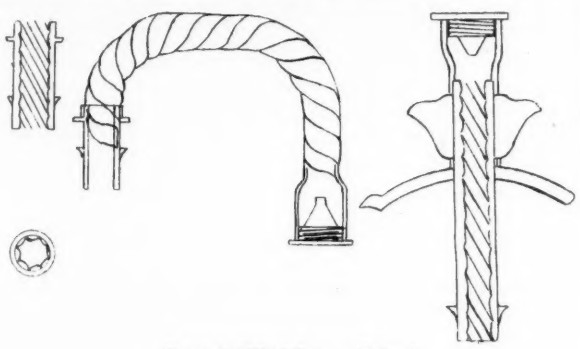
The inventors provide a gas-fitting embodying a socket member bored taper to receive a plug, of taper form, having its greatest diameter at the top; so that the weight of the fitting keeps the plug on its seating. There are vertical and transverse ports (and a passage in same) in combination with a ball-joint for preventing the rotation of the upper part of the fitting when the lower part is turned. The ball-joint embodies an outer member having recesses and an inner member in which the projections engage the recesses—all being so arranged that when the lower part of the fitting is rotated, the plug rotates with it, and the gas supply will then be fully cut off.

Inverted Incandescent Gas-Burners.

HARROP, G., of Leyton, Essex.

No. 7561; March 27, 1911.

The inventor says he has found that "a flame of high efficiency may be obtained if the burner-tube is provided with rifling grooves from the point where the air is admitted, or near thereto, to the extremity of the nozzle." The idea of passing the gas and air mixture through a twisting passage in the tube is not, he says, *per se* novel; but "in all previous attempts at obtaining a good flame by this means, a portion only of the tube has been rifled, or wires, or a twisted strip of metal has been used." He, however, finds that, "to obtain any material result, twisted grooves in the tube must be employed, and must be continued up to the point where the gas and air mixture is ignited."



Harrop's Rifled Burner-Tubes.

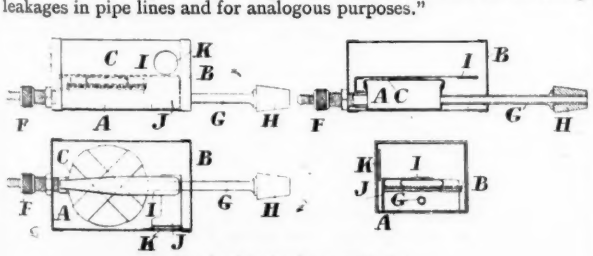
The illustration shows methods of carrying the invention into effect—a longitudinal and a cross section of a nozzle to be applied to a burner-tube which itself is twisted or bored with rifling grooves; a bent burner-tube rifled by twisting it upon itself, and provided with the nozzle shown; and another form of the burner. The nozzles, when made of fire-clay or similar substance, may, it is pointed out, be formed in a mould and the central core removed by unscrewing.

Detecting Leakage in Pipe Lines.

TATE, J. R. & F., of Bolton.

No. 10,967; May 6, 1911.

This invention provides "simple and sensitive means for detecting leakages in pipe lines and for analogous purposes."



Tate's Gas-Leakage Detector.

The illustration shows a side elevation of a leak detector constructed in accordance with this invention; also a sectional plan, a sectional side elevation, and a sectional end elevation of the instrument.

A small metal chamber A, enclosed in a case B, has one side formed by a thin rubber diaphragm C, strengthened by rubber cross bands and secured by binding threads. Inlet and outlet connections F G are provided; the inlet fitted with a non-return valve (like a pneumatic tyre valve), and the outlet with a soft rubber bung H tapered so that it will readily make a gas-tight connection when inserted into an aperture communicating with the pipe line or other system to be tested.

In order to magnify the movement occurring when the pressure on opposite sides of the diaphragm is unequal, a light spring lever or index I is fixed at one end and formed to rest on the centre of the rubber diaphragm at a convenient distance from the fixed end; the extreme free end of the index being arranged to travel over a scale or move past a fixed mark, or be provided with a shutter J (as shown) which can be moved across a window K in the case.

To use the apparatus, the adaptable bung on the outlet is inserted into some opening in the system to be tested; and by means of (say) an ordinary cycle pump a slight pressure is produced in the system—sufficient to distend the rubber diaphragm, and operate the index. If any leakage takes place, the diaphragm and index gradually return to their original position and make the presence of a leak evident. In the instrument shown, evidence of a leak is indicated by movement of the screen past the window in the opposite direction to that in which it was moved under pressure of the air from the pump.

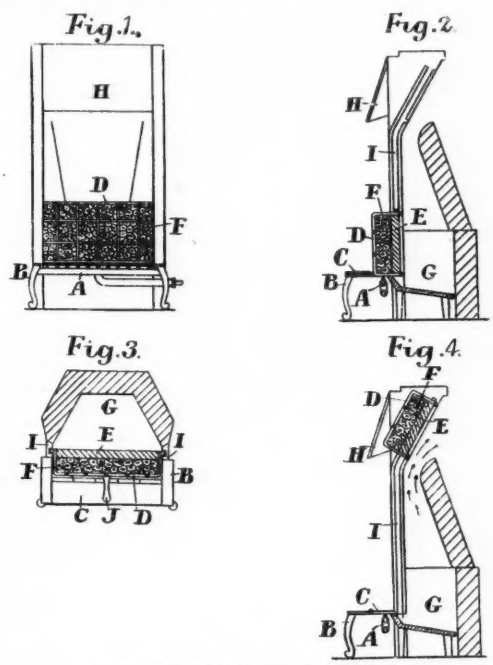
Grates Suitable for Heating either by Gas or Coal.

TEALE, L. H., of Far Headingley, Leeds.

No. 16,615; July 19, 1911.

This invention relates to domestic fire-grates designed for use interchangeably either as a gas-fire or with coal or other solid fuel. Convertible coal and gas fireplaces, as hitherto proposed, have had a gas-deflector sheet or gas-log, or some like gas-consuming device, counterbalanced or otherwise suspended so as to be capable of being lowered for use as a gas-fire in front of, or within, an ordinary open fire-grate, and of being raised and concealed within a pocket behind the mantel when a coal-fire is required. These have usually been fitted with a telescopic or extensible pipe carried by the gas-consuming device and connecting with an overhead gas supply main.

The present invention provides a convertible fireplace of the type described, but in which the gas-fire comprises a movable artificial fuel container and an entirely independent gas-burner or set of gas-burners —"thus avoiding the great objection of movable gas joints."



Teale's Convertible Gas and Coal Grate.

Fig. 1 is a front elevation of the convertible fire-grate as applied to an ordinary open fireplace and as adjusted for gas firing. Fig. 2 is a sectional side elevation. Fig. 3 is a sectional plan. Fig. 4 is a front elevation of the grate adjusted for coal or coke firing.

The gas-burners A are arranged in front of the grate, preferably on a loose trivet B supported on the hearth and having a hinged flap C over the burners. Over the burners is a receptacle D carrying the artificial fuel—consisting of a fire-brick plate or slab E in the rear, and a loose packing of asbestos or like lumps F in front. This receptacle can be drawn down to fill up the space in front of the ordinary grate G for use as a gas-fire, while when a coal-fire is required it can be pushed up (fig. 4) behind the canopy H. This movement may be effected by mounting the receptacle in grooved slides I and providing a handle J and suitable stops, or may be suspended and balanced on pulleys and chains to permit of raising and lowering.

Gas Cooking-Ovens.

POTTERTON, T., of Balham, S.W.

No. 16,916; July 24, 1911.

This invention relates to gas cooking-ovens in which the lines of burners are arranged in flue casings separated from the oven itself, "so as to prevent exposure of the article being cooked to the products of combustion of the gas." The object of the invention is "to facilitate the lighting of the burners, and to so arrange the flue casings that they can be easily lifted out for cleaning purposes"—being made in two parts or divided into separate elements.

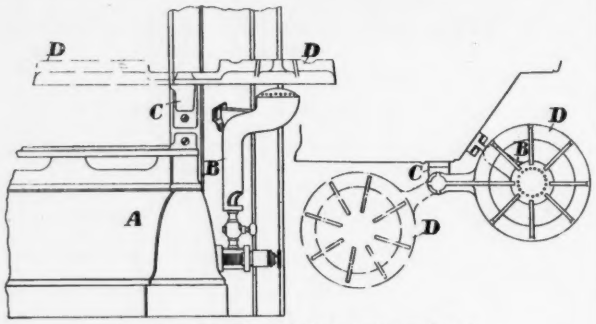
The invention is one of the details that are included in the gas-oven already described and illustrated in the "JOURNAL" for March 26, p. 870.

Gas-Fire and Other Stoves.

FLETCHER, RUSSELL, AND CO., LIMITED, of Warrington.

No. 17,319; July 29, 1911.

This invention relates to means for enabling the contents of a kettle, &c., to be heated either over an ordinary gas-fire or from a single burner if the gas-fire is not required. It has already been proposed (the patentees point out) to effect a similar object in the case of an ordinary fire-grate by means described in patent No. 705 of 1883, which consists in the combination with fire-grates of gas-burners and top bars or trivets that may be used independently or in combination with the fire. It has also been proposed to provide in connection with a gas-fire a separate burner over which a kettle may be suspended.



Fletcher, Russell, and Co.'s Gas-Fire Trivet.

The illustration shows a front elevation of an ordinary gas-fire stove with the invention in combination therewith. Fig. 2 is a plan of part of same.

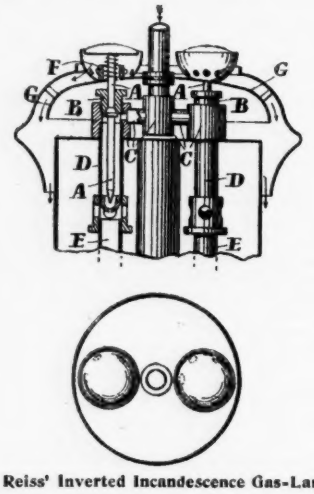
The invention consists in forming a connection between the gas supply pipe to a stove A, and a bunsen burner B, whose stem is enlarged at the top and formed with a number of small holes. A bracket C fits in at the side of the stove a trivet D, that may be turned so as to be placed either over the burner (as shown) or turned in front of or over the gas-fire as represented by dotted lines.

Inverted Incandescence Gas-Lamps.

NEW INVERTED INCANDESCENT GAS-LAMP COMPANY, LIMITED; a communication from CARL REISS, of Berlin.

No. 18,528; Aug. 16, 1911.

This invention relates to inverted incandescence gas-lamps of the type in which the cleaning needles are actuated from outside the head of the lamp; and it has for its objects: 1. To provide spring-controlled or actuated cleaning needles, arranged to pass through the unions and through the head of the lamp, thereby permitting of their being manipulated from outside the lamp, and to arrange on the cleaning needles themselves, and towards the upper part, a valve adapted to close the passage or bore in the unions or glands, so as to prevent the escape of gas while the lamp is burning—instead of arranging a valve on a horizontal spindle for actuating a vertical clearing needle as formerly proposed. 2. To provide means, in conjunction with the spring-controlled cleaning needles, whereby rain, snow, or hail are prevented from entering the lamp body or casing.



Reiss' Inverted Incandescence Gas-Lamp.

The cleaning needle A is arranged to pass through a gland B, screwed into the union C (near its bend or elbow), leading to the gas-inlet tube D and bunsen tube E. The needle further passes through a socket F, and out through the head of the lamp. The socket is secured to a curved plate or dome G carried by the gas supply pipe of the union C.

The needle is controlled by a helical spring in the socket F, and is provided with a coned valve which normally closes a correspondingly coned seating on the underside of the gland B, while the lamp is burning. At its uppermost end the needle has a dome-shaped head or knob against which the spring presses, and by depressing which the needle descends and removes any obstruction from the orifice in the gas-nipple.

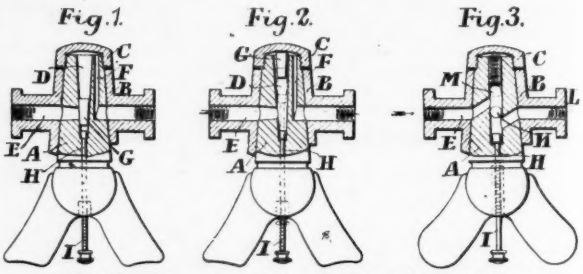
In order to prevent rain, snow, &c., entering the lamp, there is arranged around the socket F, a hemispherical shaped cup fixed to the curved plate G, and provided near its bottom with orifices through which the rain water, &c., can run off in the direction of the arrows, so preventing it entering the lamp casing.

Automatically Closing Gas-Pipes.

FIECHTL, L., and BREUNING, R., of Stuttgart, Germany.

No. 24,927; Nov. 8, 1911. Date claimed under International Convention, Dec. 27, 1910.

This invention relates to a safety device for gas-pipes—more particularly for taps which automatically close the pipe when the gas supply ceases.



Fiechtl and Breuning's Automatic Closer for Gas-Taps.

The tap (of the ordinary form) consists of a plug A, movably retained in the body B by a screw cap C. The plug is provided with a tapering passage D, with which the gas admission passage E connects. Another passage F, through which the gas reaches the place at which it is consumed, is also provided in the plug. In order automatically to close the tap when the gas supply ceases, a closing member G is inserted in the passage D, to the form of which passage the member corresponds. When gas is to be drawn through the tap, the member G is raised from its seat by (say) a pin H, which passes through the head of the plug and is under the action of a spring I. It is retained in this position by the gas current until the latter ceases, whereupon it descends on to its seat and closes the passage E.

A third construction is shown. Here, in place of the conical closing member, a ball K is employed, which is inserted in the path of the gas current. In the closed position, the ball shuts off the outlet passage L of the plug from the inlet passage E. The ball is also held raised by a pin H, and held up by the gas current in the passage M of the plug, and on the cessation of the current drops on to its seat.

Charging and Discharging Coke-Ovens and the Like.

HUESSENER, K., of Twickenham, S.W.

No. 25,690; Nov. 17, 1911. Date claimed under International Convention, Nov. 17, 1910.

The inventor of these means of charging and discharging coke-ovens and the like points out that pinion drive has been employed in most previous devices of the kind; but it has turned out to be heavy to operate, so that a large motive power had to be used in comparison with the useful effect produced. Also the toothed portion of the charging bar, which was shaped as a rack, had to enter the oven, with the result that the highly-strained teeth suffered alterations of structure. The bar also was warped; and this change of shape in turn produced unfavourable effects on the pinion gearing.

In the present invention, the pinion drive is replaced by rope or chain drive. But rope driving has already been proposed for discharging machines for use with gas-retorts—in patents No. 16,223 of 1904 and No. 7355 of 1910, as also for levelling devices in coke-ovens in patent No. 21,755 of 1909. In the case of the first patent, however, a telescopic pushing bar is in question, in which each portion of the bar is operated by a separate pair of ropes. The rope-drive proposed in the 1910 patent operates continuously in the one direction, so that no saving of power is effected and no hoisting tackle effect is produced. The 1909 patent shows the application of a rope-drive to a levelling device for coke-ovens; but though in this case the ropes work in opposite directions, the principle of the pulley block is, nevertheless, not employed. All these devices can only be used when the strain is small, and will fail to act where a high output is required—such as in pushing coke out of ovens, for which purpose a force of from 50 to 60 H.P. is not infrequently necessary.

According to the present invention, two tractive members are made use of, which are connected to the charging bar and wound on corresponding drums, chain bobbins, or the like. The drums are operated alternately, in known manner, by change gear, so that one of the drums is always running loose. A novel feature of the invention is to allow this driving device to act on two tractive members which are connected with the rear end of the bar; and, in consequence of their being shortened (as the result of winding), they drive the bar forward or draw it backward, after the manner of a set of pulley blocks.

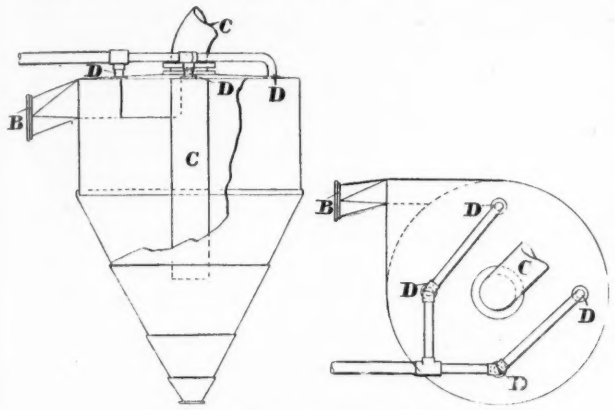
Removal of Naphthalene from Coal Gas.

SIMON, E. D., of Manchester.

No. 5651; March 7, 1911.

In plants for the manufacture of gas, coke, or where large quantities of coal gas are given off, the patentee points out that trouble is experienced owing to the deposit of naphthalene as the gas cools—naph-

thalene which he has found may be removed by subjecting the gas to centrifugal or whirling action in a chamber while tar is sprayed into it. The naphthalene then is deposited with the tar on the walls of the chamber, and the gas allowed to pass away from the centre. The chamber he proposes to employ consists of an ordinary cyclone-extractor, such as is used for tar extraction ; the gas being caused to pass in at the circumference with considerable velocity, and leave by the centre, while nozzles are arranged in the top through which the tar is sprayed.



Simon's Cyclone Naphthalene Extractor.

The cyclone-extractor shown has a pipe B, through which the gas to be freed from naphthalene is led, and a pipe C from which the gas is led away. D are the spraying nozzles employed—of "any convenient construction, so mounted in the roof of the cyclone-extractor that they spray the whirling gas with tar." The naphthalene separates out from the gas, and is taken up by the tar; while the tar itself "acquires whirling motion from the gas and settles down on the walls of the extractor."

Effecting the Combination, with Sulphurous Acid, of Ammonia and Sulphuretted Hydrogen, contained in Gases, &c., and Obtaining Ammonium Sulphate.

FELD, W., of Linz-on-the-Rhine, Germany.

No. 5838 ; March 8, 1911.

The patentee points out that the combination of ammonia and sulphuretted hydrogen contained in gases, &c., by treating them with gaseous sulphurous acid, free sulphurous acid, or bisulphites dissolved in water, is known—the action of the sulphurous acid on the ammonia producing ammonium sulphite, while the action of sulphurous acid on the sulphuretted hydrogen liberates sulphur. This process has the disadvantage that, in consequence of the dissociation of the ammonium sulphite and of the high vapour tension of sulphurous acid and ammonia, part of the sulphurous acid and ammonia escape uncombined. For the same reasons the sulphurous acid escaping with the gases cannot be retained by washing them with ammonia water; and the evaporation of the solution containing the ammonium sulphite is attended with great losses. Consequently, the ammonium sulphite crystals thus obtained constantly lose ammonia and sulphurous acid ; and the crystals (on account of their reducing properties) are not suitable for use as manure.

It has been proposed to oxidize the ammonium sulphite into sulphate by treatment with air. But by this treatment, ammonia and sulphurous acid are evaporated and lost with the escaping air ; and the oxidation is not complete. It has also been proposed to add pentathionate of ammonium to acid (or neutral) solutions of sulphite of ammonium, and to treat gases containing ammonia and sulphuretted hydrogen—previously, or subsequently, to the treatment with the sulphite solution—with caustic ammonia. By treating gases containing ammonia and sulphuretted hydrogen with sulphurous acid or solutions of ammonium sulphite, with or without the addition of ammonium pentathionate, and with the addition of caustic ammonia to the gas (in order to form hydrosulphuret of ammonia), a solution of sulphite, thiosulphate, and sulphate of ammonium is obtained. But the amount of thiosulphate will be comparatively small if the gases contain less than one proportion by weight of sulphuretted hydrogen to one proportion by weight of ammonia. It has also been proposed to treat ammonia-water—such as gas-water—with sulphurous acid to form ammonium thiosulphate, by which treatment also a mixture of ammonium sulphite with ammonium thiosulphate is obtained. But this is not the object of the present invention. It has further been proposed to evaporate solutions obtained by the treatment of gases containing ammonia and sulphuretted hydrogen and containing sulphite, thiosulphate, and sulphate of ammonium. But, by such evaporation, part of the ammonia and of the sulphurous acid will be lost, and the crystals obtained will be a mixture of sulphite, or thiosulphate of ammonium with sulphate of ammonium and free sulphur, which is not suitable for use for any purpose. It is not the object of the present invention to obtain such crystals. It has also been proposed to convert the ammonium sulphite alone, or mixed with ammonium thiosulphate, and obtained by such treatment of gases containing ammonia and sulphuretted hydrogen into ammonium sulphate by treatment with sulphuric acid. But according to this invention, the patentee does not use sulphuric acid for the formation of sulphate of ammonia from sulphite (or thionates) of ammonium. "The aforesaid inconveniences caused by the formation of sulphite of ammonium are especially apparent when the gases, vapours, or liquids, containing the ammonia contain no sulphuretted hydrogen, or less than one proportion by weight of sulphuretted hydrogen to one proportion by weight of ammonia."

The patentee states that he has found that, in order to overcome these disadvantages, it is necessary to avoid the final formation of ammonium sulphite, and to control the reaction of ammonia (or ammonia and sulphuretted hydrogen) with sulphurous acid or acid sulphites in such a way that only thiosulphates, or polythionate or both ("thionates") are produced. For this purpose, it is necessary with gases which contain more sulphuretted hydrogen than is equivalent to the ammonia present, to supply so much sulphurous acid that, in spite of the slow reaction between sulphurous acid and sulphuretted hydrogen, for each proportion by weight of ammonia, at least one proportion by weight of sulphur is separated. This is, however, only possible when there is present such a large excess of sulphuretted hydrogen as will render the excess of sulphurous acid harmless. As such regulation is difficult, he prefers to add sulphur (or a sulphur-yielding substance) to the liquor with which the gases are treated—the sulphur being obtained either during the process or from any other source as finely ground native sulphur. If there be an excess of sulphurous acid, he uses a sulphide or a polysulphide $(NH_4)_2S_5$, which will react with sulphurous acid forming thiosulphate of ammonia and free sulphur ; while if there be no excess of sulphurous acid, he uses a polythionate $(NH_4)_2S_4O_6$, which will react with sulphuretted hydrogen forming thiosulphate and free sulphur.

Even if there be less sulphuretted hydrogen than corresponds to the ammonia, only thiosulphate of ammonia will be formed by the simultaneous reaction of ammonia, sulphurous acid, and free sulphur.

As excess of sulphur does not affect the reactions, but rather assists them, it is advisable, in all cases, to add sulphur or a sulphur-yielding substance. The sulphur may be added to the washing liquor either before or after the washing operation ; and the liquor may be either acid, neutral, or basic. The formation of thiosulphate from sulphite and free sulphur is, however, more readily effected with neutral (or basic) liquors than with sulphurous acid liquors. By the conversion of the ammonia into thionates, the losses of ammonia and sulphurous acid are avoided—the ammonium thiosulphide neutralizing any excess of sulphurous acid in forming ammonium polythionates,

$$2(NH_4)_2S_2O_3 + 3SO_2 = (NH_4)_2S_3O_6 + (NH_4)_2S_4O_6.$$

A liquor is finally obtained which contains (besides ammonium thiosulphate and polythionates) the sulphur added in excess, and eventually part of the sulphur resulting from the mutual reactions.

The sulphur may now be filtered off, and, by the process hereafter described, the ammonium thionates may then be converted into sulphate, with the simultaneous separation of sulphur. It is, however, preferable to first effect the conversion of the thionates into polythionates and then into sulphate, or directly into sulphate, and only then to filter off the sulphur separated by this process.

If gases (for instance, coal gases) containing ammonia be subjected to the process, he carries out the invention as follows: Gaseous sulphurous acid is introduced into the gas, and this is simultaneously washed with water, or with ammonium salt solution, to which sulphur is added. It is, however, preferable to wash the gas with water, or ammonium salt solution, in which sulphurous acid, or an acid sulphite, or a polythionate of ammonia, of an alkali, or of an earth alkali (or a mixture of them) is dissolved and sulphur is held in suspension.

He also extracts the ammonia from the gas by washing it with water, and then treats with the ammonia water thus obtained (which contains the ammonia absorbed partly in the form of hydrate, partly as carbonate, and partly as sulphide and polysulphide) gases containing sulphurous acid ; sulphur (or a sulphur-yielding substance such as polythionate, sulphide or a polysulphide of an alkali, earth alkali, or ammonium) being added in such proportion that the ammonium sulphite formed by the action of sulphurous acid on the ammonium hydrate or carbonate is converted into thiosulphate.

The gases and washing liquor may be supplied to the washing apparatus in opposite directions ; but it is preferable to supply them in the same direction. In the first case, the gas is subjected to a second washing process after leaving the first washer—the washing liquor used in the second washer containing ammonium thiosulphate, or an alkali, or an earth alkali, thiosulphate. The thiosulphate will absorb the sulphurous acid contained in the gas, or which escapes from the liquor, and polythionate be formed. If, however, the gas and washing liquor be supplied in the same direction, the thiosulphate, formed by the reaction between the ammonia, sulphur, sulphurous acid, and occasionally sulphuretted hydrogen. will, in the further course of the washing process, absorb the excess of sulphurous acid—polythionates being thereby formed.

The gas and liquor will react as stated, whether they be cold or hot. The temperature depends upon the temperature of the gases to be treated. If it is desired to further concentrate (with ammonium salt) the liquor leaving the washing apparatus, the liquor is again saturated with sulphurous acid ; polythionate being formed from the thiosulphate, and then this solution is again passed through the washing apparatus. According to requirements, sulphur is, from time to time, added to the liquor. If, however, the gas contains considerably more sulphuretted hydrogen than corresponds to the ammonia, no further addition of sulphur is needed during the second passage of the liquor through the washing apparatus ; but it is necessary that a sufficient amount of free sulphur, or of polythionate, shall be present in the lye.

By the alternate treatment of the liquor with gas containing ammonia and with sulphurous acid, the liquor gradually absorbs such an amount of ammonia, and accumulates so much ammonium salts, that it can be advantageously used for the manufacture of crystallized ammonium sulphate. For this purpose, the liquor is treated with sulphurous acid (air being added if required) and heated. By this treatment, the thiosulphate present is, in the first instance, converted into polythionate. This treatment with sulphurous acid is continued (preferably at from 40° to 65° C.) until most of the thiosulphate has been converted into polythionate. Thereupon the liquor is more strongly heated—preferably up to boiling point—whereby the polythionates are decomposed into free sulphur and sulphate ; sulphurous acid being evolved. It is not necessary, in the latter stage of the process, to introduce more sulphurous acid ; but a further supply will do no harm.

The sulphurous acid not absorbed in the process, as well as that

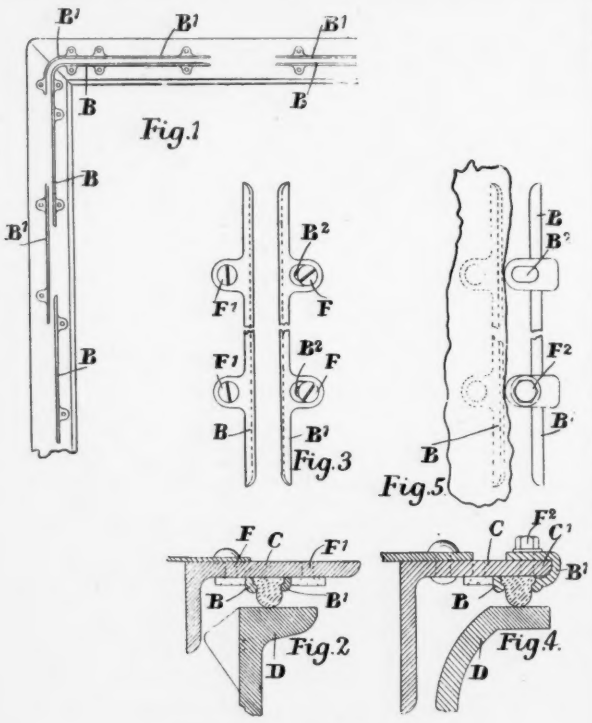
evolved by the decomposition of the polythionate, can be used for the treatment of the thiosulphate liquor coming from the gas. After the conversion of the salts in the liquor into sulphate is completed, the sulphur is separated from the ammonium sulphate solution in a centrifugal apparatus (or filter press) or by decantation, or by simple draining; and, after being washed, it is used, as already stated, partly as such, and partly in the form of sulphurous acid; and any excess of sulphur yielded (in consequence of the presence of sulphuretted hydrogen in the gases treated) may be utilized for other purposes. The pure solution of ammonium sulphate, which can be so readily enriched in the gas washing operation that it finally contains 40 per cent. or more of ammonium sulphate, is evaporated *in vacuo*, or in an open vessel, until it crystallizes and the ammonium sulphate is separated (which can be done as usual) from the mother liquor.

Joint-Forming Devices for the Covers of Gas Purifiers.

CLAPHAM, T. S., of Keighley.

No. 8650; April 7, 1911.

In introducing his specification, the patentee says: Heretofore the fixing of the strips of india-rubber to the under surfaces of the lids or covers of purifiers has been effected by placing the rubber within grooves or channelled metal strips of dove-tail shape in cross section; but considerable labour and care have to be expended in fixing the metal strips upon the metal covers, so that between the metal strip and the cover a gas-tight joint might be produced. Sometimes the metal strips have been secured in position by bolts or fixing-pieces passing through them; whereas when side clamping pieces have been used they have not had any undercut part to receive the broader part of the strip of rubber. Hence in such cases the fixing of the rubber depended on being held between the two straight faces of the clamping parts. To obviate the necessity of exercising any great care in the fixing of the india-rubber strips to produce a gas-tight joint throughout the whole length of the strips and on both sides, while yet retaining the dove-tail or equivalent shape (in cross section) of the rubber strips, is the object of the present invention.



Clapham's Joints for Gas-Purifiers.

Fig. 1 is a plan of a portion of the lid of a purifier, showing the improved parts in position. Fig. 2 is a sectional end elevation of a portion of the lid, also illustrating the improved fixing device. Fig. 3 is a view of parts shown by fig. 2, as seen from beneath. Fig. 4 is a similar view to fig. 2, but illustrating a modification of the invention. Fig. 5 is a plan of fig 4.

Instead of mounting the strips of indiarubber A in channelled metal strips, holding pieces B B^1 are used in lengths to suit the positions they are to occupy on the purifier cover. These holding pieces are in the form of "jaws," as fig 2—one jaw B being mounted on one side of the rubber strip, and the other jaw B^1 on the other side. The shapes of the edges of the jaws are such as to engage with any overhanging flange or to enter any recess in the edge of the rubber as the formation of the rubber may necessitate, to enable the jaws on the two sides to hold the rubber in position against the cover C. Thus, when the cover is forced down upon the body part D of the purifier, the rubber is pressed on both sides, and a gas-tight joint is produced.

The lengths and dimensions of the strips forming the jaws may be varied, and they may be arranged opposite each other throughout their entire length, or placed in alternate positions (both illustrated by fig. 1); while to enable the strips to carry away the rubber with, or cause it to adhere to, the cover, so as to be removed from contact with the surfaces of the body beneath, and be carried at all times by the cover, the strips may be secured in position by screws F F^1, by bolts G G^1, or by rivets, as found most appropriate. In the formation shown by fig. 4, where the flange C^1 of the cover is not sufficiently broad for the screws F^1 to be employed, the part B^1 is extended so as to pass around the edge of the flange, to be secured to the upper surface by screws F^2.

Production of Liquor Containing Ammonium Chloride in the Carbonization of Coal.

BEIMANN, W., of Wakefield.

No. 9358; April 15, 1911.

The liquor which condenses from the volatile products obtained by carbonizing coal or the like, whether in gas-retorts, coke-ovens, or gas-producers, generally contains ammonium chloride, says the patentee, the recovery of which, as such, is rendered difficult or expensive owing to the large amount of water which must be evaporated before the ammonium chloride will crystallize.

According to his invention, the water vapour in the volatile products from the retort is condensed fractionally, so that there may be obtained a liquor richer in ammonium chloride than the liquor obtained by condensing the water vapour as a whole. Such enriched liquor constitutes the first fraction or earlier fractions; and these fractions are returned to the carbonizing chamber as often as may be necessary, "so that a liquor is finally obtained which is sufficiently rich in ammonium chloride to pay for evaporation."

This return may be effected, for instance, by feeding the liquor directly into the carbonizing chamber, or by feeding the liquor into the drainage bunkers of the coal washers; so that it may displace the normal moisture of the coal. The liquor can be sprayed into the carbonizing chamber.

The invention is said to be particularly applicable in connection with the freeing of coke-oven gas from its tarry contents at temperatures near to the dew-point of the water it contains, by means of a tar spray or the like. The liquor which settles out of the tar constitutes a fraction of the whole aqueous condensate, and contains ammonium chloride. It is mixed into the coal before charging, or into the charge during or after charging the oven; and when the charge is carbonized, the liquor which settles out of the tar caught by the tar spray contains more ammonium chloride than that which was returned to the oven contained. This return is repeated until the desired degree of concentration has been attained.

APPLICATIONS FOR LETTERS PATENT.

9467.—RUSSELL, G. W., "Auto-meter exchange till." April 22.
9538.—STIMSON, E. F., "Gas-heated water-circulators." April 22.
9553.—HEYS, J., "Connections for pipes." April 23.
9560.—SADLER, E., "Mantle device." April 23.
9589.—DEUTSCHE-HÜTTENBAU GES. M. B. H., "Gas-generators." April 23.
9603.—WOOD, F., "Rapidly determining the consistency or density of tar and the like." April 23.
9613.—GREEN, T. W., "Blowers or pumps." April 23.
9623.—HARGER, J., "Analysis of gases." April 23.
9649.—SUESS, W. E., "Stop-cocks." April 23.
9650.—ETOURNEAU, A., "Lighting and extinguishing burners." April 23.
9664.—SALOMON, A. J., "Acetylene generators." April 24.
9731.—SAVILLE AND DUNCAN, LTD., and DUNCAN, H. E., "Delivering gas under constant pressure." April 24.
9743.—GIBSON, R., "Gas-producers." April 24.
9746.—AUTO-MECHANISCHE INDUSTRIE (SOCIÉTÉ ANONYME), "Gas-producing apparatus." April 24.
9775.—HELPS, G., "Gas lamps and burners." April 25.
9799.—FRAIN, J. S., EATON, J. H., and SIMPSON, D. H., "Petrol-gas making machines." April 25.
9813.—MUELLER, O. H., "Pressure regulating apparatus." April 25.
9835.—MITCHELL, E. A., "Pressure controlling systems." April 25.
9864.—FEARON, J. A'H., "Retort." April 25.
9871.—PATERSON, W., "Measuring flow of fluids." April 25.
9892.—SUTCLIFFE, J. H., "Carburetting air." April 26.
9900.—STURGE, W. H., "Suspending gas-pendants." April 26.
9917.—RUWELL, W. F., "Compressor pumps." April 26.
9960.—TILLEY, F.C., "Inverted gas-lamp." April 26.
9962.—NARR, F., "Repairing water cocks." April 26.
9989.—WADDELL, A., "Vertical retort-settings." April 27.
9993.—FABRY, R., "Coke-loading machine." April 27.

Agitation against Co-Partnership.—In the agitation among the gas workers in London which has lately made itself manifest, the co-partnership system, it may be remembered, came in for some adverse criticism. A similar line is being taken by agitators in the Provinces; and in a leaflet issued by the Aldershot Branch of the British Socialist Party, an attempt is being made to engender discontent among the gas workers in the town with the scheme which has been introduced by the Gas Company. The Socialists believe that "harmony between employers and employed is impossible." The attention of the employees of the Aldershot Gas Company may be directed to the condition of their fellow-workers in the other co-partnership gas companies as furnishing evidence to the contrary. In the course of a speech delivered recently by Mr. Clavell Salter, K.C., M.P., at Aldershot, he referred to the introduction of profit-sharing by the Gas Company, and the action of the Socialists in regard to it. He characterized it as "a violent attempt to persuade the people of Aldershot not to look upon this or any other profit-sharing concern, because they insisted in the belief that harmony between employer and employee was impossible." He should like to ask the Liberals of Aldershot if they countenanced this sort of thing, and if they approved of it. He should say "No."

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Automatic Locking Gear for Gasholder Cups.

SIR,—I observe in your last issue a paper by Mr. A. F. Young, the Engineer and Manager to the Bury St. Edmund's Gas Company, read before the meeting of the Eastern Counties Gas Managers' Association. Among his "reflections and suggestions" in connection with gasholder construction, he advances the idea of an automatic locking gear for gasholder cups, as a possible remedy for the prevention of such accidents as that at Ilkeston.

I would like to point out to Mr. Young that (there is "nothing new under the sun") this idea was incorporated in gasholders built so far back as 1865; the gear then used being constructed by Messrs. Thomas Piggott and Co., of Birmingham.

I enclose three photos., one of which shows this gear on an old holder here, which is about to be dismantled. It will be observed that the gear consists of a double cheek bracket fixed to the dip of the second or third lift, as the case may be, in which is fixed a weighted trip-bar, which has two cheeks with eccentric slots in them. Between the cheeks of this trip-bar is a pawl, to which are fixed pins working in the eccentric slots.

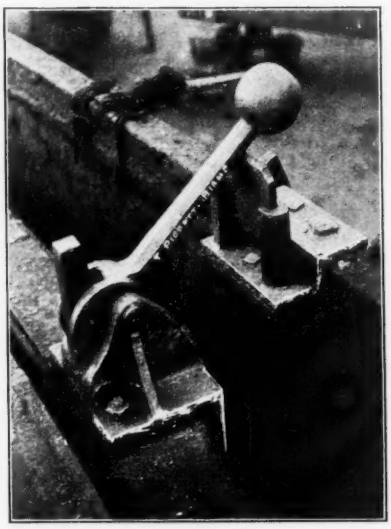
On the other two photographs (which show the lifts of another holder, from which the pawl has been removed) a catch will be observed on the inner lift, with which a pawl engages. The inner lift first cups with the outer lift; the outer lift then commences to rise; and after it has risen a foot or so, the weighted trip-bar, bearing on a catch fixed about 6 feet high above the tank side, works the pawl over into the catch on the inner lift. The weight at the end of the trip-bar keeps it locked in this position; and it is impossible for the inner lift to uncup from the outer lift until the outer lift is almost grounded again. On descending, when the outer lift is within a foot or so from grounding, the weighted trip-bar strikes the trip fixed on the edge of the tank; and, as the lift further descends, it brings out the pawl from the catch by the eccentric motion, and the inner lift is free to descend.

Particulars as to the photographs are given; and possibly these may be of interest in connection with the paper and discussion recently reported.

T. O. PATERSON, Engineer.

Birkenhead Corporation Gas-Works, May 1, 1912.

P.S.—I may say that this gear has been out of use for a great many years past, as it requires constant attention to keep it in safe operation, and in the end there is always the question as to whether it is a matter of vital importance.



Shows Piggott's Hydraulic Cup Locking-Gear on the Two-Lift Holder at the Birkenhead Corporation Gas-Works—Erected about 1865 and now about to be dismantled to make room for Extensions.

[Note the eccentric slot in the knocker cheeks.]

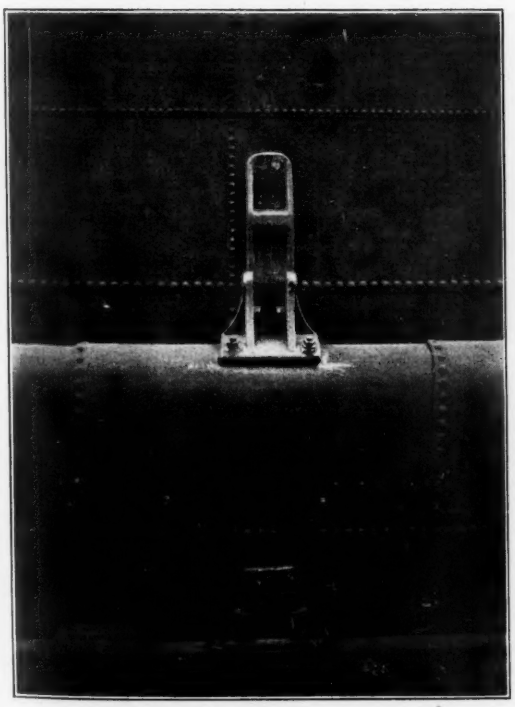
Agreed Clauses in Private Acts.

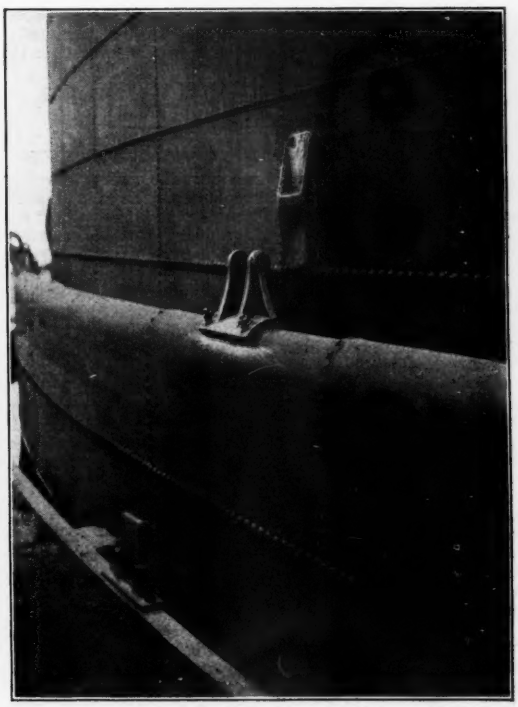
SIR,—In your report of the Committee stage of the Staffordshire Potteries Water Bill, I observe some very important remarks made by the Chairman of the Committee (Sir E. Cornwall) with reference to a clause inserted in the Bill at the request of the North Staffordshire Railway Company.

I have nothing whatever to say on the merits of the case in question; but I do think public attention should be drawn to the constant practice of including in Private Acts clauses imposed upon promoters by petitioners, and agreed to for the simple purpose of avoiding opposition at the Committee stage. Such clauses become, under our present system, precedents; and I have frequently come across cases where the Board of Trade and the Local Government Board (in connection with Provisional Orders) and Committees of Parliament (in connection with Private Bills) have accepted similar clauses with small consideration for their merits, and almost entirely upon the strength of "precedents."

My suggestion is that this practice should be discontinued; and, with this in view, I consider Sir E. Cornwall's suggestion that "agreed clauses" should be indicated by asterisks, an excellent one—granted that in future such clauses should not be imposed on the ground of "precedents," but should be, in every case, considered "on merits."

A recent example of this was a clause imposed by a rural council absolutely prohibiting the stopping of traffic in roads for the purpose of laying gas-mains. This clause was urged as justified by precedent; but as the chief witness for the promoters, I had to oppose it to the utmost, on the ground that it would prevent the promoters from ever laying mains in any roads less than 15 feet wide in the clear. It was urged that the clause did not prevent the laying of mains, but only the stopping of traffic; and, assuming this to be the case, it was obvious that the result would be very prejudicial to the public convenience, in that traffic approaching an open trench would be allowed to use a road, part of which was impassable, and then have to turn back in order to go round another way, whereas, under ordinary conditions, a





Front and Side Elevations of the Catch on the Inner Lift and the Fixture for the Trip-Gear on the Outer Lift.

[This trip-gear has been removed for some years.]

notice at the end of the road would divert traffic at a minimum of inconvenience.

It was, however, extremely doubtful whether the Courts would so interpret the clause; and, in any event, grave inconvenience would very likely have resulted if the clause had been conceded without amendment. Ultimately, it was amended to allow of the stopping of traffic with the written consent of the rural council.

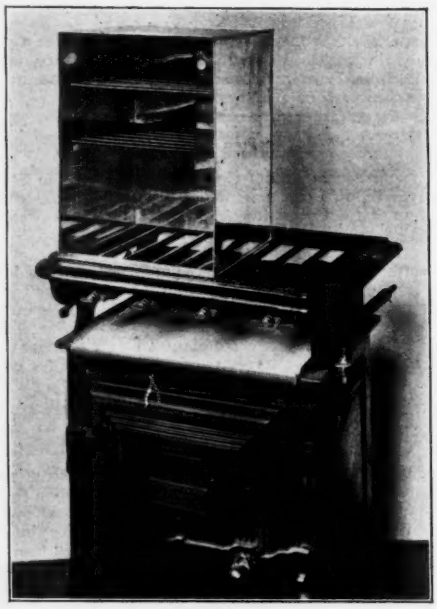
This point may be of interest to other promoters of both gas and water schemes.

PERCY GRIFFITH, M.Inst.C.E.

51, *Parliament Street, S.W.*,
May 1, 1912.

Preventing Waste of Heat from Gas Cooking-Stoves.

SIR,—Referring to your "Editorial Notes" in the "JOURNAL" for April 2, *re* the great amount of heat wasted from the top plate of gas-cookers, I enclose a photograph of a simple arrangement for utilizing this heat, for which I have lately taken out a provisional patent.



Being one of the collectors to the Liverpool Gas Company, I am naturally interested in all matters appertaining to gas appliances, and should esteem it a favour if you would give publicity to my idea.

I have one in use on my own cooker; and the practical success of it is beyond all question. In preparing the breakfast, for instance, the plates required are heated to a very high temperature on the top rack in a few minutes; and the food, when grilled, is placed upon the second rack to keep hot, while toast is being made. The kettle also will boil several minutes quicker when placed inside the "Ovenette."

I have also covered in my provisional specification the arrangement of a hinged lid, which can be dropped down if necessary, when it practically becomes an auxiliary oven—there being heat enough to cook a pudding or warm up any food that is required.

J. P. HARRIS.

Castle Road, Liscard, May 1, 1912.

The Recent Advances in Gas-Stove Prices.

SIR,—The notices just received from the makers of gas-stoves of a still further advance in the price of these articles, on top of the one made so recently as February, gives one cause for cogitation.

The writer is a believer in trades unionism, and he trusts in combinations, too, up to a certain point. The producers have come to the opinion that the workers have pushed their demands too far, and their customers may come promptly to the same conclusion with regard to the price being demanded for goods.

What a charming unanimity there is in the phrasing of the notices: "Continued substantial increases in the cost of our materials, and further concessions to our workpeople." But, for one, the present writer declines to accept this additional demand as being justified, and he will seriously consider recommending the withdrawal of stoves on simple hire except such as are in stock. If this policy were adopted on anything like a large scale, gas managers would soon find prices coming to their level. Also, in cases where free stoves are supplied, weeding-out the unprofitable ones would obviate the purchase of new stoves.

It may be urged that this is what is commonly termed "cutting off one's nose to spite one's face." But there is not going to be such a profit on gas for cooking as has been the case previously, in view of the certain enhanced cost of coal. Taking the cases of stoves costing £4 and £2 last year. Let anyone ask himself how much gas these would have to consume to return a profit with the extra prices of 12s. (15 per cent.) and 8s. (20 per cent.) added to them.

The stove-makers have certainly shown themselves better tacticians than the miners, as they have selected for their *coup* the period of maximum demand, and when there is a boom in the use of gas for cooking owing to the effects of the coal strike. But in spite of this, the writer trusts the gas industry does not intend to take the announcement referred to "kneeling-down," as if this move is acquiesced in calmly, it will not be long ere another one will be forthcoming.

TYKE.

April 30, 1912.

PARLIAMENTARY INTELLIGENCE.

CALORIFIC POWER STANDARD AND TEST.

Illuminating Power Superseded in the Wandsworth Bill.

The Wandsworth Amalgamation Bill will be the first British gas measure to be entered in the Statute Book that contains a calorific power standard and test to supersede illuminating power as the quality to which the Company's staple commodity is to conform in future. In view of this fact, which will become of historic note, the clauses that have been agreed are reproduced *in extenso*.

CALORIFIC POWER OF GAS SUPPLIED.

(1) As from the first day of January one thousand nine hundred and thirteen, the standard calorific power of the gas supplied by the Company shall be one hundred and thirty-six calories gross per cubic foot (the expression "calories" being used in this Act as meaning calories gross per cubic foot); but the Company shall not incur any liability in the event of their supplying gas of a calorific power of not less than one hundred and twenty-two calories.

(2) One testing only for calorific power shall be made at each testing-place on any one day; but in the event of the calorific power being on any testing ascertained to be below one hundred and fifteen calories, a second testing shall be made at an interval of not less than one hour from the time of making the first testing at that testing-place, and the average of the two testings shall be deemed to be the calorific power of the gas at such testing-place on that day, and the gas examiner shall forthwith give notice of the results of such testings to the Company.

PROVISIONS AS TO TESTING FOR CALORIFIC POWER.

The following provisions shall apply with respect to the testing for calorific power of the gas supplied by the Company and to penalties in respect of deficient calorific power of such gas.

(1) The Company shall, within six months from the date of the amalgamation or from the date of the provision of the testing-place (whichever shall be the later), cause to be provided at each of the prescribed testing-places apparatus for testing the calorific power of the gas supplied by the Company at such testing place or places; and the said apparatus and the mode of making the tests shall be the same as shall from time to time be prescribed by the Metropolitan Gas Referees.

(2) The gas examiner of the local authority may at any testing-place of that authority test at any hour of the day or night the calorific power of the gas supplied by the Company at such testing-place.

(3) If on any one day the gas supplied by the Company at any such testing-place is of less calorific power than one hundred and twenty-two calories to an extent not exceeding seven calories, the gas examiner of the local authority shall (if the local authority contemplate proceeding for a penalty) make at such testing-place a testing of the calorific power of such gas on each of the two following days; and the average of the three testings so made shall be deemed to represent the calorific power of the gas on such one day at such testing-place.

(4) The Company shall not be liable to any penalty for defective calorific power where the calorific power on any day of the gas supplied by them at any such testing-place is not less than one hundred and twenty-two calories; but where the calorific power on any day of such gas is less than such last-mentioned quantity, the Company shall be liable to the following penalties in respect of such deficiency—that is to say:

Where the deficiency does not exceed three and one-half calories, two pounds.

Where the deficiency exceeds three and one-half calories but does not amount to seven calories, a sum not exceeding five pounds;

For each complete seven calories of defective power, a sum not exceeding ten pounds.

(5) The provisions of section 31 of the Gas-Works Clauses Act, 1871, shall apply to any testing made under this section.

(6) For the purposes of this section, section 33 of the Gas-Works Clauses Act, 1871, shall be construed as if calorific power were therein referred to in addition to illuminating power and purity: Provided that the Company shall not be liable to any penalty in respect of any testing for illuminating power.

POWER TO BOARD OF TRADE TO VARY STANDARD CALORIFIC POWER.

If within one month after the expiration of a period of three years from the first day of January one thousand nine hundred and thirteen, or after the expiration of any subsequent period of three years, either the Company or any local authority within the limits of supply of the Company shall desire that the standard calorific power prescribed by the section of this Act of which the marginal note is "Calorific Power of Gas Supplied" shall be reduced or increased, and shall give to the other parties and to the Board of Trade notice in writing of such desire, it shall be lawful for the Board of Trade, after hearing the parties and considering any representations made to them by any of the said parties, by order to reduce or increase the amount of the said standard calorific power and of the deficiency below such standard within which the Company are not to be liable to penalties or either of such amounts to such extent as to the said Board may seem fit; and the said Board may by such order make all such modifications of this Act as may be necessary in consequence of any such reduction or increase as aforesaid, and may also direct the manner in which the costs, charges, and expenses of the said parties and of the said Board of and incidental to any such application, and any inquiry held by or under the direction of the said Board in connection therewith, shall be borne.

GAS COMPANIES BENEFIT FUNDS.

The Lea Bridge, Maidenhead, Southgate and District, and North Middlesex Bills.

The Unopposed Bills Committee of the House of Lords on Tuesday passed the following four Bills relating to the establishment of benefit funds by Gas Companies—viz., the Lea Bridge, Maidenhead, Southgate and District, and North Middlesex Gas Companies. It will be remembered that a Bill was introduced at the beginning of the session by seven Companies, including the above, dealing with the question of benefit funds; but the authorities of the House ordered that each Company should bring in a separate Bill. The other Bills are those of the East Cowes, the St. Albans, and the Brighton and Hove Gas Companies. The Brighton Company's Bill was before a Committee of the House of Lords on Thursday, and is noticed below.

The Bills provide that the Directors of the Companies may, in any year, set aside, as part of expenditure on revenue account, a sum not exceeding ½d. per 1000 cubic feet of gas supplied by the Company during the year; but the amount standing to the credit of such benefit fund at any time is not to exceed five years' contributions to the fund at the above rate. The Bill also authorizes the Directors of the Companies to apply the funds by way of pensions or other allowances, and to enter into agreements with insurance companies in this connection. The fund may also be invested; and if any scheme involving contributions by the employees is devised, it must not come into operation until the Companies have been registered under the Friendly Society Act.

The Bills were ordered to be reported for third reading—there being no reports upon them and no amendments.

The Brighton and Hove Bill.

The Bill of the Brighton and Hove Gas Company came before the Committee of the House of Lords presided over by the Marquis of Bath, last Thursday.

Mr. Balfour Browne, K.C., and Mr. Freeman, K.C., appeared for the promoters. The only petitioner was the Brighton Corporation, represented by Mr. Honoratus Lloyd, K.C.

Mr. Balfour Browne, in explaining the objects of the Bill (set out above), said this was the only Bill of this description before Parliament this session which was opposed.

Mr. *E. L. Burton*, the Secretary of the Company, said they were already paying pensions to a number of their workmen who had become worn out in the service of the Company; and on a five years' average these pensions worked out at a weekly average of 16s. 3d. per man. It had been calculated that if the Company did not pay these pensions, they would have to pay an increased wage per man of 2s. per week, as the pensions were regarded in the light of deferred pay; and this would amount to £4400 per annum. This was nearly double the amount of the fund which would be formed under the Bill, the payment into which, on the basis of the gas sold during the last five years, would be £2700 per annum. The pensions and sick pay during the same period amounted to £1400 per annum. The proposed fund under the Bill was not intended to apply to the senior officers of the Company, but only to those on the weekly wage list. Further, there was no intention of paying any pensions out of any other fund than the one proposed under the Bill—*i.e.*, the existing pensions would be a charge upon the fund.

Mr. Honoratus Lloyd said this was certainly not the case as the Bill stood.

Mr. Freeman said that the intention was as stated by witness; and he was prepared to make the point as clear as possible.

In cross-examination by Mr. Honoratus Lloyd, witness said the object of the Bill was to put the question of pensions and sick pay upon a statutory basis, and to give every workman a right to a pension. At present, the granting of pensions was in the discretion of the Directors and shareholders. Counsel pointed out that the Bill only said that the Directors may form a fund, and that they may, if they think fit, pay out pensions, which did not seem to give the men much of a statutory right.

Mr. Honoratus Lloyd, in his address to the Committee (he did not call evidence), said that the real object of the opposition was to prevent the formation of another fund under the Bill from which to pay pensions, in addition to paying the already existing pensions, and thus taking from revenue money which should go towards reducing the price of gas to the consumer. Already the price in Brighton was very high—viz., 2s. 10d. per 1000 cubic feet, compared with 2s. 6d. in a number of other South Coast towns; and he suggested that the Company did not require any further powers for paying pensions than those already existing.

The Committee, however, passed the preamble of the Bill, subject to it being made clear that there was to be only one fund out of which the existing as well as future pensions were to be paid.

WANDSWORTH, WIMBLEDON, AND EPSOM DISTRICT GAS BILL.

HOUSE OF LORDS COMMITTEE.—Thursday, May 2.

(*Before Lord* Ribblesdale, *Chairman*, *Earl* Westmeath, *Lord* Sempill, *Lord* Langford, *and Lord* Herschell.)

This Bill has for its object the amalgamation of the Wandsworth and Putney Gaslight and Coke Company, the Mitcham and Wimbledon District Gaslight Company, and the Epsom and Ewell Gas Company.

Mr. Balfour Browne, K.C., Mr. Honoratus Lloyd, K.C., Mr. C. C. Hutchinson, K.C., Mr. E. J. Naldrett, and Mr. A. M. Paddon appeared for the promoters—the Parliamentary Agents being Messrs. R. W. Cooper and Sons. Though a number of petitions had been presented against the Bill, only two opponents appeared by Counsel—namely, the Surrey County Council and the Epsom District Council (represented by Mr. G. J. Talbot, K.C., and Mr. Jeeves), and the Sutton Gas Company (represented by Mr. Courthope Munroe).

Mr. Balfour Browne, in opening the Bill, explained its objects. There were only two opponents, and neither of them really opposed the preamble. It was proposed to amalgamate the three Companies mentioned into one; leaving the powers over each district precisely as they are at the present time, with the obvious advantage that, while the supply of gas would continue practically as it is to-day, there would be great economies by getting rid of the three boards of management, the three sets of officers, &c. As neither of the petitioners named were appearing against the preamble, he would say no more as to the objects of the Bill. The Sutton Gas Company desired certain protection for their mains, and also wished to be allowed to supply in a small portion of the Epsom Gas Company's area in the parish of Banstead—the remainder of Banstead being in the Sutton Company's area. The Epsom Company had been giving a small supply in this district for many years under statutory powers; but now that the amalgamation was proposed, the Sutton Gas Company objected to the amalgamated Company having any powers in this small area. With regard to the Surrey County Council, the point there was that in the Bill the Company proposed to fix a minimum depth of 2 feet for the laying of future mains; whereas the County Council wished to have the limit fixed at 3 feet.

Mr. *H. E. Jones* was called, and gave evidence as to the beneficial effect of amalgamations of gas companies. He explained the circumstances under which the Epsom Company were allowed by Parliament to supply in the small portion of the Sutton Company's area, and expressed the opinion that it was not the practice of Parliament to take away any part of a gas company's area because they amalgamated with another. As to the protection for the Sutton Company's mains, he contended that a clause offered by the promoters was sufficient.

Mr. *E. H. Stevenson* supported the views of Mr. Jones. With regard to the protective clause offered, he suggested that the addition of words providing for arbitration might save litigation.

The case with regard to the Sutton Company occupied a good portion of the day, though it only concerned a comparatively small point. Eventually,

The Chairman suggested that, so far as the protection of mains went, the Sutton Company were entitled to a clause, which would be satisfactory to them, from the bigger Company. As to the arrangements for supply in the portion of Banstead in dispute, the Committee were not prepared to annul a statutory arrangement. [The clause for the protection of the Sutton Company's mains contains the provision that the Company shall have seven days' notice from the amalgamated Company of their intention to lay mains in the Sutton Company's area for the purpose of linking-up the Wimbledon and Epsom areas, and that no mains of the amalgamated Company shall be within 5 feet, measured horizontally, of any mains or pipes of the Sutton Company.]

Consideration was then given to the dispute between the promoters and the Surrey County Council, as to the depth at which mains should be laid. A long clause was suggested, the effect of which was that all new mains laid under the Act should be at a depth of 3 feet.

Mr. Talbot, in putting the clause before the Committee, said that the ground upon which he relied was that the traffic on the Surrey roads had increased in recent years in a way not differing in degree from what it formerly was, but differing absolutely in kind. The weight and speed of the traffic had increased out of all knowledge, with the result that, whereas 2 feet was ample years ago, under modern conditions 3 feet was not too deep.

Mr. Honoratus Lloyd argued that the Gas-Works Clauses Act gave the County Council power, if they disapproved of what the Company proposed to do, of appealing to the Justices, who could order a depth of 10 feet if they liked. All that, he said, was necessary was a minimum of 2 feet, and let the Justices do the rest.

Mr. Talbot said that leakages in gas-mains were exceedingly frequent, and entailed great expense in repairing the roads. For this reason, the County Council regarded it as a very important matter that mains should be laid at such a depth that they would not be interfered with by the new conditions of traffic.

Mr. Honoratus Lloyd pointed out to the Committee that none of the local authorities concerned had objected to the proposed minimum of 2 feet.

Evidence was then called on behalf of the County Council to show that the effect of the increasing weight of traffic on the roads was to increase the possibility of damage to gas and water mains—hence the necessity for a greater depth, both in the interests of the public and of the Gas Companies themselves. The witnesses were Mr. *A. Dryland*, the County Surveyor of Surrey, Alderman *A. Pain*, of the Surrey County Council, and Mr. *Thomas Ware*, the Surveyor to the Rural District Council of Epsom. Leakage in these mains, it was stated, was caused mostly by vibration; and the witnesses had no recollection of a main 3 feet deep having to be opened-up for the purpose of searching for a leak. An instance was mentioned of one particular main on the London Road, Ewell, which, for a great portion of its length, was laid at 3 feet, and the remainder, owing to special circumstances, was at a less depth. In the latter portion, openings were frequently being made on account of leaks. Reference was also made to a case of the Leatherhead Electric Supply Company, in which, after an appeal to the Courts, a depth of 2 feet was awarded the Company. But there was constant trouble with these electric light mains on account of this, in spite of the fact that electric light mains were more flexible than gas-mains.

Friday, May 3.

Evidence in the other direction was called this morning.

Mr. *H. E. Jones* supported the minimum of 2 feet, but was willing to agree to any other depth according to circumstances.

Mr. *Charles Hunt* said that his practice in Birmingham for many years was a minimum depth of 2 feet; and in no part of the city did the depth exceed 2 ft. 6 in.

Mr. *Charles Cooper*, the Engineer and Surveyor to the Wimbledon Corporation, said that proper support underneath the pipe was of

greater importance than the earth above it, and that a 3 feet minimum was an unnecessary provision.

Mr. *Percy J. Sheldon*, the Essex County Surveyor, disagreed with fixing any minimum at all, and favoured leaving the matter to the practical experience of the engineers concerned. In the important roads in Essex, mains were not laid at any depth beyond 2 feet, and no trouble had been experienced.

Mr. *Frank Jones* said that he would never refuse to comply with the reasonable requests of the local authorities concerned as to the depth. All the Bill provided was that mains should not be laid at a less depth than 2 feet.

Mr. HUTCHINSON then addressed the Committee on behalf of the promoters on this point, and asked that the general law should be left as it is. Experience had shown that 3 feet as a cast-iron minimum was impracticable; and the matter should be left so that such a distance could be fixed as circumstances dictated. Not a single complaint had been alleged against any of the Companies concerned in the present promotion as to the way they had carried on their works in the past; and here was a suggestion to fix a minimum which would apply to any class of road, whether there was traffic or not.

The CHAIRMAN, after clearing the room, announced that the Committee were of opinion that the Bill might proceed with the substitution of 3 feet for 2 feet in clause 51a.

Mr. NALDRETT, for the promoters, said he presumed that this restriction would be limited to the area of the Surrey County Council, and not apply to the part of the Company's area which was outside the county.

Mr. TALBOT remarked that, of course, he had no right to ask for anything outside the County of Surrey.

The room was again cleared for the Committee to deliberate upon this point. When the parties were re-admitted,

The CHAIRMAN said that the Committee were of opinion that the 3 feet minimum depth should apply to the whole area of the amalgamated Companies under the Bill.

On the consideration of clauses,

Mr. JEEVES, for the Surrey County Council, had a number of clauses giving special privileges to this body in respect of notice to lay mains, positions of mains, &c.

For the promoters, it was argued that the clauses were a modification of the general law, and should not be granted.

The CHAIRMAN said he did not think the Committee were inclined to put any onerous obligations of this character upon the Company. They did not want to load the Company up with numerous little regulations, and certainly did not wish to get a lot of small regulations into an Act of Parliament. The Committee were not disposed to interfere with the general law.

Mr. JEEVES then put in further amendments.

The CHAIRMAN reminded him that he must not attempt to touch, by a side-wind, anything provided for by the general law.

Mr. JEEVES said his first amendment asked for seven days' notice, instead of three, of intention to lay mains.

The CHAIRMAN said that, in the opinion of the Committee, this point had not been raised in a sufficiently tangible form in Mr. Jeeves' petition for them to consider it.

Mr. JEEVES said, in view of these remarks from the Chairman, he would not press further amendments he had intended to do.

The remaining clauses of the Bill were then decided; and it was ordered to be reported for third reading.

Agreed Chemical Clause.

When the Bill was first introduced, a petition was deposited on behalf of the United Alkali Manufacturers' Association; but nobody appeared before the Committee in support of this petition. This was the direct result of a new clause having been inserted in the Bill, as follows:—

> The Company shall be established for the purpose of manufacturing, storing, and supplying gas for lighting, heating, motive power, and other purposes within the limits of supply as defined by this Act, and may convert, manufacture, and sell all residual products resulting from the manufacturing of gas by them, and generally may carry on any business usually carried on by gas companies; but the Company shall not purchase, or use in any process of manufacture, any materials other than those required for the making and supply of gas by them, or for the working-up of their own residual products, or for the construction, maintenance, and repair of their gas-works, plant, and buildings, or for the manufacture and repair of gas-fittings.

WAKEFIELD GAS BILL.

HOUSE OF LORDS COMMITTEE.—Wednesday, May 1.

(*Before Lord* BARNARD, *Chairman*, *Lord* FALKLAND, *Lord* BRABOURNE, *Lord* AMHERST, *and Lord* ORANMORE AND BROWNE.)

The objects of this Bill, which is promoted by the Wakefield Gaslight Company, are to define and extend the limits of supply, sanction additional land to be used for gas purposes, including the diversion of a footpath, to authorize the conversion of ordinary shares into stock and the raising of additional capital, to reduce the illuminating power, and to adopt the standard burner.

Counsel for the Bill were Mr. HONORATUS LLOYD, K.C., Mr. CLODE, and Mr. A. M. PADDON. The opponents to the Bill are the Wakefield Corporation, represented by Mr. VESEY KNOX, K.C., and Mr. RALPH BURY, and the Stanley Urban District Council, represented by Mr. WEDDERBURN, K.C.

Mr. HONORATUS LLOYD stated briefly the history of the Company. They were incorporated by an Act of Parliament in 1822, re-incorporated in 1847, and further powers were granted in 1856 and 1877 respectively. The last time the Company were before Parliament was in 1877.

The CHAIRMAN: That rather destroys the theory, does it not, that a gas company should be before Parliament about every fifteen years?

Mr. HONORATUS LLOYD agreed that it did, and said there was no doubt that in 1877 the Company were granted too large capital powers. As a matter of fact, it was not yet all expended. The capital of the Company was divided into inconvenient values, bearing varying rates of interest. Under the 1847 Act, the capital authorized was £25,000, in shares of £25 each, bearing a standard dividend of 10 per cent. Under the same Act, capital amounting to £18,300, in £5 shares, bearing a standard dividend of 10 per cent., was also authorized. Under the 1856 Act, capital was authorized to the extent of £36,700, also in £5 shares, bearing a 7½ per cent. standard dividend; and in 1877, capital amounting to £75,000 was authorized, of which £50,000 had been issued as ordinary stock in £10 shares, bearing 7 per cent. maximum dividend, and £20,000 as preference stock. This gave a total of £155,000. Thus they had a number of stocks of different values all bearing different standard rates, which was, to say the least, a little confusing. They had also loan capital under the 1877 Act of £18,700, which, added to the authorized share capital, made a total of £173,700. All of this had been issued except £5000 in shares under the 1877 Act, and £7200 loan capital; making a total of £12,200 unissued. Of the issued capital, the whole of it had been spent with the exception of £12 1s. 2d., which they now had in hand. The present quality of gas was 15-candle power; the burner used being Sugg's No. 1 argand. The standard price was fixed in 1877 at 3s. 6d.; and it might interest the Committee to know, in view of what had been said in the York Bill, that at the time this was fixed the actual price charged was 3s. The dividend was 5 per cent. more or less for each penny reduction or increase in the price of the sliding-scale; and although the price actually charged had varied from time to time according to contingencies, it was now 2s. 6d. Dealing with the definition of existing limits of supply, Counsel explained that in the districts of Crigglestone and Horbury there was a dispute as to whether the Company or the Ossett Council had the right to supply. The Company had certain mains laid; and in order to do away with this dispute, it had been agreed to hand these districts over to the Ossett Council—the latter buying the Company's mains and pipes in these districts at an agreed figure. To this, there was no opposition. With regard to the extension of the limits of supply, although at the time the Bill was drafted a large number of districts were included in the new area, a certain number had been taken out, and now only the districts of Crofton, Walton, Chevet, and Woolley were included. As to additional lands, the Company purchased by agreement in 1897 certain land adjoining the gas-works; and they now sought authority to use this for gas purposes. Although 1500 notices had been sent out in this connection, there was no opposition. The only opposition in respect of this was by the Corporation, who objected to the use of the land on the ground that there was no necessity for such utilization, and, further, desired the Company, in diverting a footpath, to convert this, at their own expense, into a roadway. Dealing with the conversion of capital, Counsel said that, although their standard rates of dividend varied, as he had already explained, Parliament had given the Company a uniform increment of 5s. per penny, up or down. The more modern practice, however, was to provide for an increment varying according to the rate of interest payable; and this was what they had endeavoured to do in the Bill. The present capital paid up was as follows: £25,000 in £5 shares, carrying 10 per cent.; £23,300 in £5 shares, carrying 10 per cent.; £36,700 in "B" fifth £5 shares, carrying 7½ per cent.; £50,000 new £10 shares under the 1877 Act, carrying 7 per cent.; and £20,000 preference stock, carrying 4½ per cent. Thus, eliminating the preference shares, there were four classes; and the problem was the most convenient way of getting rid of them. The simplest way of all was, of course, to convert into one class of stock; but in order to maintain existing rights, it was impossible to do this. The only way to avoid doing injustice to anybody was to convert them into two classes; and the scheme proposed was as follows: For each £100 held of original £25 or £5 shares, they gave £200 of 5 per cent. stock in the form of £100 maximum 5 per cent. and £100 standard 5 per cent. The next class was that for each £100 held of "B" fifth £5 shares they gave £150 of nominal 5 per cent. stock—being £50 maximum 5 per cent., and £100 standard 5 per cent.; and for each £100 of new £10 shares under the 1877 Act, they gave £140 of 5 per cent. stock—being £40 in maximum 5 per cent, and £100 in standard 5 per cent. This was the only way the Company could conceive of dealing with the matter, having regard to the fact that at present there was a uniform increase or decrease, to which the shareholders were entitled, irrespective of the rate of dividend on the stock The scheme proposed, although altering the nominal value of the capital, maintained exactly the same amount divisible in dividend.

Mr. WEDDERBURN asked why the ordinary course, of having one class of stock, was impossible.

Mr. HONORATUS LLOYD replied that it was because at present there was a 5s. increment per penny, which each class of share was entitled to take irrespective of the percentage rate of interest. If Mr. Wedderburn was able to convert this into one ordinary stock, with a uniform increase, he would make him a very handsome present. Counsel went on to say that the Company were also asking for their borrowing powers to be made up to one-third of the authorized capital—giving £37,325 in addition to what they now had. The additional capital asked for under clause 19 was £52,000, either at 5 per cent. maximum or preference. Lastly, the Bill asked for one-third borrowing powers in respect of this, giving an additional £17,333, or new capital of £69,333, which, together with the additional borrowing powers in respect of the existing share capital, made the total capital powers under the Bill of £106,658, to which had still to be added the £12,200 remaining unissued—making an aggregate of £118,858, *plus* the £12 1s. 2d. in hand from capital already issued. Another matter to which he referred was a clause which at present compels the Company to supply everybody at the same price, no matter for what purpose the supply was used. The Company were asking to be put upon the modern basis—namely, to supply under different circumstances at different prices; all consumers under similar circumstances, of course, being granted the same terms. The petitions against the Bill were only two; the most important being that of the Wakefield Corporation, who

contended that the capital powers asked were unnecessary, and should be restricted. They also raised the question of the proposed reduction of the illuminating power and standard burner in the form that this matter had been raised in the York Bill—a reduction in the standard price being asked for on account of the advantage accruing to the Company by these changes. They also asked for a calorific test. The petition of the Stanley Urban District Council raised similar points, and complained of the bad quality of the gas. They suggested 2s. 6d. as the standard price, and objected to the formation of a special purposes fund, the clause relating to which was in common form.

Thursday, May 2.

When the proceedings were resumed this morning,

Mr. *William Cash*, the first witness for the Bill, explained the details of the proposed conversion of stock outlined by Counsel.

The CHAIRMAN, referring to the position that there was at present the same increment irrespective of the percentage which the stock carried, asked witness if he thought this was an oversight on the part of Parliament at the time.

Witness said he did not think so. It was allowed at the very commencement of the days of the sliding-scale, and was inserted in other Bills as well. The Company, although they had reduced the price from time to time, had not increased the dividends as they were entitled to under their Acts; and the money not thus distributed had been used for capital purposes of the Company, and did not bear interest.

Mr. WEDDERBURN cross-examined to the effect that it was quite possible to have one class of stock, which was the usual procedure, and much more simple. Witness agreed that the present proposal was a new one; and while he did not know whether there had been conversions to one class of stock in the case of other companies similarly situated, he was perfectly certain that it had not been done without the shareholders having to sacrifice something—an argument which Counsel did not controvert.

Mr. VESEY KNOX, for the Wakefield Corporation, cross-examined on similar lines in respect to this point—mentioning that, in the case of the Fleetwood Bill this year, the shareholders did sacrifice something. Witness argued that, from the past records of the Company, if the present conversion was sanctioned, and it did increase the value of the stock, it was no more than the shareholders were entitled to. On the question of repairs and maintenance, it was agreed that the cost of this last year amounted to 12·06d., compared with what Counsel called the average figure of 5½d. "Did not this," asked Counsel, "want a good deal of explanation?" Witness held that the Company had been keeping down their capital account by not distributing all the dividends they might have done; and the money so saved had been spent in keeping the works in a high state of repair. This was obviously to the advantage of the consumers. Counsel next suggested that all the sums not distributed did not belong to the shareholders, but that the consumers were entitled to a portion. Consequently, it would seem that the price was capable of reduction by at least 6d. Therefore, if the price at which the Company could sell now was 2s. per 1000 cubic feet, surely the 3s. 6d. maximum in the Bill was too high? Witness did not agree, and stated that an allowance of 6d. for repairs and maintenance in a company of this character was not enough.

Mr. *Harry Townsend*, the Engineer and Manager of the Company, dealt with the standard price and the candle power.

Mr. VESEY KNOX said he raised no point about the testing-place, but only as to the hours during which the Corporation could test.

Mr. WEDDERBURN said he wanted a testing-place in Stanley.

Witness said there was already a testing-station at the works, and another at the Town Hall—the latter belonging to the Corporation. He then went through the proposals of the Bill.

Mr. VESEY KNOX said the Wakefield Corporation would not now oppose the gas lands, except as regards the footpath referred to in the opening speech by Counsel.

Mr. WEDDERBURN indicated that he, also, would not oppose the new lands.

Witness then gave reasons for the new capital proposed. The rate of increase in the make of gas during 1911 was 3·38 per cent.; and the increase in sales was about the same. He anticipated that £140,000 of new capital would carry the Company along for the next fifteen years, during which time the following works and plant would be required: New retort-house, £20,000; gasholder, of a million cubic feet capacity, £17,750; purifiers, £9334; distributing plant, £35,000; slot meters and fittings, gas cookers, and fires, £32,000. A number of small items and contingencies made up the total of £140,000. The amount of extra dividend which might have been paid during the years 1894 to 1903 was £27,156, while revenue expenditure which might fairly have been charged to capital amounted to £26,286.

In cross-examination, witness said that the reason why he could not agree that a capital expenditure of £400 per million would suffice for the future in Wakefield was that consumers purchased cooking and heating apparatus, &c., to a much less extent than any other place in Yorkshire, or even in London—thus entailing more capital expenditure on the part of the Company. A similar reason held as regards the large amount spent on renewals; there being so much more of the hired-out apparatus to be maintained. Under the circumstances, he did not think the amount excessive. In the case of eleven London suburban companies in 1910, the cost of repairs and maintenance was 11·03d. Witness objected to the Corporation of Wakefield having powers to test during the daytime The Company were at present tested to death, and, furthermore, the test was for candle power for illuminating purposes, and people did not want light during the daytime. If the Wakefield Corporation desired further powers than those given in the Gas-Works Clauses Act, they must get them by revision of general legislation. He objected to a third testing-station in Stanley, if penalties were to be attached.

Friday, May 3.

Witness, in re-examination this morning, said the conditions of the Corporation test at the Town Hall were such that the Borough Analyst was practically always testing stale gas, because there was no gas consumption in the Town Hall, nor along a good portion of the main supplying the testing-station.

Mr. VESEY KNOX said it might shorten matters if he offered to accept the hours of testing granted in the case of the York Bill.

Mr. PADDON said this offer could not be accepted.

Dr. *W. Statter*, the Chairman of the Company, was then called, and explained the wishes of the Directors not to interfere with the existing rights of the shareholders in the capital conversion scheme, and the difficulty which had been experienced in devising any method for giving one class of stock.

Mr. *Corbet Woodall* spoke to the same effect, and supported the proposals of the Bill generally. He said that the rate of increase over a period of recent years at Wakefield had been 2 per cent.; but he thought it would be reasonable to reckon upon a future increase at the rate of 5 per cent., because, as in so many other places, the vigour of the competition of electricity was now to a large extent spent, and the gas companies would get back to a more normal rate of increase than recently. He anticipated that in twelve years the Company would be making an additional 220 million cubic feet of gas. He strongly deprecated the suggestion that the existing standard price should be interfered with, and contended that it was the practice of Parliament, in the case of a sliding-scale company coming for additional powers, not to interfere with their existing maximum price if a reasonable one.

This completed the case for the promoters.

Mr. WEDDERBURN then addressed the Committee on behalf of the Stanley Urban District Council, and urged that, as there were 14,000 inhabitants in this district, they were entitled to a testing-station, which he offered to instal at the Council's expense. As to the capital conversion scheme, it was plain that this was quite a novel one. He called attention to a report of the Local Government Board, in which a comment of a similar character was made, and which urged the Committee to be quite satisfied that the proposal was in the interests of all concerned. He suggested that if a 2s. 6d rise all round were adopted there would be no need for two classes of stock; and though this might interfere to a slight extent with some of the existing rights of shareholders, it would be fair to the consumers. Closely connected with this point was the standard price; and this he asked should be reduced to 3s. From the evidence of Mr. Woodall, it would appear that the standard price and rise and fall were sacrosanct; but this was almost inconceivable, judging from the report of the Local Government Board, which recommended the alteration in the rise and fall. This Department could not be accused of wishing to introduce novelties—generally, its tendencies were in the opposite direction.

Mr. HONORATUS LLOYD said this point had been discussed before the Lord Chairman; and he saw the difficulty at once with regard to having one class of stock. Furthermore, the Local Government Board report did not say anything about existing rights.

Mr. WEDDERBURN, continuing, argued that the standard price at the start of the Company was absolutely unfair; and it was a question as to whether it should not be reduced to a lower figure than he had suggested, in view of the price at which gas could be manufactured at the present day. As to the need for further capital, the increase in the past was a far simpler test than an estimate of what the future was likely to bring; and his witnesses would say that under £50,000 new capital was all that was necessary for the next fifteen years.

At this point, for the convenience of two witnesses from Wakefield, evidence on behalf of this body was interposed.

Mr. *E. Hirst*, the Chairman of the Finance Committee of the Corporation, complained of the high price of gas compared with other towns of similar size in Yorkshire.

Mr. *E. R. Chaplin*, Analyst to the Corporation, handed in some figures of tests which he had made of the Company's gas.

Both the Chairman and Mr. Honoratus Lloyd, in cross-examination, pointed out that these figures had been put before the Committee, but no deductions had been drawn from them; and although, in re-examination, Counsel for the Corporation had endeavoured to show that the figures were unfavourable to the Company, he hardly carried his witness with him.

Monday, May 6.

The case for the opposition was concluded to-day, and the Committee's decision was announced in the afternoon.

The CHAIRMAN said the Committee found the preamble of the Bill proved, subject to the following conditions: A supply of gas might be given in Woolley, on condition that 6d. per 1000 cubic feet extra be charged; there would be the same hours as to testing as were given in the York Bill; the Committee were not disposed to alter the general law as to pressure, which was 8-10ths; and the charge for public lighting was to be the lowest made to any consumer for lighting purposes. With regard to the capital conversion scheme, the Committee would pass the proposal of the promoters; but the standard price must be reduced from 3s. 6d. to 3s. per 1000 cubic feet. The Committee could not grant all the new capital asked for; but instead of the £50,000 wanted, they would allow £30,000 new 5 per cent. maximum stock, of which £15,000 might be raised as preference stock, with the necessary reduction in borrowing powers. Finally, the Stanley Council would have authority to erect a testing station at their own expense.

The following addition to clause 8 has been agreed to by the promoters: "But the Company shall not purchase or use in any process of manufacture any materials other than those required for the making and supply of gas by them, or for the working-up of their own residual products, or for the construction, maintenance, and repair of their gas-works, plant, and buildings, or for the maintenance and repair of gas-fittings."

Output of Gas at Belfast.—The quantity of gas made at Belfast during the twelve months to March 31 was as follows: Coal gas, 1,224,282,000 cubic feet; water gas, 1,114,241,000 cubic feet; total, 2,338,523,000 cubic feet. The total for last year was 2,283,649,000 cubic feet. Thus there is an increase on the present occasion of 54,874,000 cubic feet, equal to 2·40 per cent. The gas sent out was: 1912, 2,339,289,000 cubic feet; 1911, 2,283,856,000 cubic feet—increase, 55,433,000 cubic feet, or 2·42 per cent.

YORK UNITED GAS BILL.

HOUSE OF LORDS COMMITTEE.—Monday, April 29.

(*Before Lord* BARNARD, *Chairman*, *Lord* FALKLAND, *Lord* BRABOURNE, *Lord* AMHERST, *and Lord* ORANMORE AND BROWNE.)

Further evidence was heard to-day on the Bill promoted by the York United Gas Company, the opening proceedings in which were given in the "JOURNAL" last week (pp. 307-310).

Counsel for the Bill were Mr. HONORATUS LLOYD, K.C., Mr. C. C. HUTCHINSON, K.C., and Mr. S. RAIKES. The opponents were the United Alkali Manufacturers' Association, represented by Mr. J. D. FITZGERALD, K.C., and Mr. LYNDEN MACASSEY; the York Corporation, by Mr. J. D. FITZGERALD, K.C., and Mr. F. T. V. BAYLEY; owners and occupiers in the neighbourhood of the works and proposed new lands, by Mr. G. W. BAILEY, Mr. C. E. ALLEN, and Mr. FRERE (Parliamentary Agent).

Mr. *Harry Woodall* said that an increase of 2½ per cent. upon the business of the Company during the next 14 years would give an additional output of 200 million cubic feet of gas; and in assuming £600 per million, he thought they were taking a very moderate figure—£750 being a quite usual one. The increase during the past ten years had been 1 per cent. In his opinion, it did not matter much what dividend the new stock bore, so long as it was sold by auction. He also agreed with the proposal to increase the borrowing powers on the existing capital, except as regards the first £100,000, to one-third (similar to the borrowing powers proposed for the new capital), and further explained that, by giving the Company the additional powers asked for in respect of new land, the works could be carried on without nuisance better than if the works were in a cramped position. Dealing with the contemplated increases in cost of production, due to coal, labour, and the Insurance Act, he calculated that, on the present output, these would entail an extra expenditure of £5600, or 2·66d. per 1000 cubic feet. He also handed in figures showing that the York Company are now supplying gas at a cheaper rate than any other company in Yorkshire with a similar output. He objected to a suspensory purchase clause being inserted in the Bill, because it prejudged the case without all the circumstances having been before the Committee, and, further, in the large majority of cases where such powers had been granted they had never been acted upon. Again, such a clause would give the Corporation the right, if they purchased, to supply gas in an area which, in their petition, they contend does not want a supply. It had also been suggested that a second testing-station should be provided away from the works. This, however, was only done under special circumstances where the area is very large and extended a considerable distance from the works. Neither had he ever heard of a case where official tests had been taken without the company being represented. But this was the wish of the Corporation.

Mr. FITZGERALD cross-examined witness with regard to the rate of increase, which he said was 2½ times the increase during the last ten years, and said that if the same rate were assumed for the future it would not even be necessary to enlarge the gasholders. Witness said, however, that, in his opinion, the small rate of increase during the past ten years had been due to the competition of the electric light; but this was to a considerable extent over now. The electricity undertaking had taken all the gas users it was likely to get, and the rate of increase in the future would be greater. On the question of price to the consumers, Counsel cited Sheffield (1s. 4d.), Plymouth (1s. 9d.), Wandsworth (1s. 9d.), and the famous case of Widnes (1s). Both Plymouth and Wandsworth, replied witness, had a very much larger output: while there were special circumstances in the others which accounted for the difference. Counsel said the point was that the cheaper the price the greater the output; whereas in the case of York it had been hinted that the price might go up. Witness replied that, from the information he could get, he saw a possibility of gas costing more than an extra 2d. per 1000 cubic feet. In arriving at the standard price, he had credited 0·66d. for the reduction of candle power; but he had allowed practically nothing for the new burner, because this had been granted in many cases without any consideration. As to the testing-station, he said that only a small proportion of water gas was used. He did not agree that coal gas lost any appreciable portion of its candle power in passing through the mains; and for this reason he did not agree that the testing-station should be away from the works. Counsel contended that there were several instances where a clause providing for a testing-station away from the works had been forced upon gas companies; and he cited the case of West Ham last year.

In connection with the opposition of frontagers and owners near the existing and proposed works, Counsel occupied considerable time urging that there was no possibility of the supply in the new areas ever being profitable.

The CHAIRMAN interposed with the remark that there was no opposition from the local authorities concerned, and that the question really was as to how supplying in the extended area would affect the petitioners close to the works.

Mr. BAILEY, who represented some forty frontagers, said that it might involve extensions of the works, and that the nuisance would be increased.

Witness, in reply to a large number of questions on this matter, pointed out that no complaints had ever been made against the gas-works, and there was not the slightest possibility of the works being carried on less efficiently in the future than in the past. There was also a provision in the Bill for the construction of a wall and the planting of trees which would hide the works from the view of occupiers of certain Crown property close by, the owners of which were quite satisfied.

In re-examination, witness corrected his statement that the increase during the past ten years was 1 per cent. This should have been 0·45 per cent. compound. He also dealt again with the case of Sheffield, put by Mr. Fitzgerald; and, in reply to Mr. Honoratus Lloyd, said that the capital cost at Sheffield was £260, and that, due to the sale of residuals, the cost of coal was actually ½d. less than nothing—that was to say, there was a credit on the cost of coal. At Plymouth, a factor in their low charge was that the Company had been able to sell a large quantity of land at a considerable profit. Again, at Wandsworth, the coal was delivered by water, and, due to the sale of residuals, the net cost of coal was only 3·57d. At Widnes, there was actually a profit on the coal of 1⅛d. These were certainly not fair cases from which to deduce what should be done at York. In further reply to Mr. Honoratus Lloyd, in re-examination, witness agreed that the Act provided for the particular candle power tested at the works; and if the gas were to be tested away from the works, and it did lose on its way through the mains, then a higher candle power would have to be provided at the works. If this were to be so, then consideration must be given to it in the price.

In answer to the CHAIRMAN, Mr. FITZGERALD said that it was generally the case to have testing-stations half-a-mile to a mile from the works, at which point most of the loss disappeared.

Both Mr. HONORATUS LLOYD and witness disagreed with this statement.

Mr. *J. H. Hill*, the Manager and Secretary of the York United Gas Company, agreed with all the previous evidence, and dealt with a few special matters. He stated that the number of consumers at present in the City of York was 18,892, and in the existing small area outside York the number was 1622. A steady and continuing demand existed for stoves, fittings, &c., supplied through slot meters. He had been on the works for 48 years, and had never had any complaints as to the carrying on of the concern. The cost of labour during the first three months of the present year had been £271 more than in the corresponding period of 1911.

Mr. FITZGERALD cross-examined the witness as to who was responsible for the introduction into the Bill of the original standard price of 2s. 10d., which has been withdrawn.

The CHAIRMAN said that at this stage of the proceedings the matter of the standard price appeared to be the most important question in the Bill. Perhaps it would help the promoters to know that this was in the minds of the Committee, because the more light that could be thrown upon the question the better.

Witness, who was further questioned, was unable to say who was responsible for the figure of 2s. 10d. He believed it came from Westminster. Mr. Fitzgerald, however, reminded him that both Mr. Corbet Woodall and Mr. Harry Woodall had repudiated any responsibility for it. The matter was allowed to rest there for the present.

Mr. FITZGERALD, in further cross-examination on behalf of the York Corporation, contended that the Company's accounts had not, in the past, been kept in accordance with the schedule in the Gas-Works Clauses Act, which the Company were bound to do. Why had not the expenditure upon new meters been placed to capital account as it should have been?

Witness said it had been omitted at the suggestion of the Surveyor of Taxes, at which there was some laughter.

Mr. HONORATUS LLOYD explained that this was quite correct. The Surveyor of Taxes, in respect of these short-life articles, allowed them, for the purposes of income-tax, to be charged to revenue and not to capital. This explained why, up to a certain year, these items had been charged to capital, and since then to revenue.

In his further cross-examination, witness admitted that since 1906 prepayment meters and fittings and stoves had been purchased out of revenue, as since that time no new capital had been issued. He also stated that a portion of the new lands scheduled in the Bill had been in the hands of the Company for thirty years, and that it was now desired to have authority to use them for the purposes of the gas undertaking if required. At present, they were partially used as allotments for the Company's workmen. The Bill also sought powers to purchase additional lands by agreement, and to use them for the purposes of the undertaking.

In re-examination, the question of charging meters, prepayment fittings, &c., to revenue and not to capital was explained. From this it came out that the amount charged to revenue was the depreciation on these particular items, and that the remainder was charged to capital. This was represented in the over-expenditure on capital account—viz., £9418. Nevertheless, this over-expenditure was well within the unexpended capital powers, which amount to £15,000—viz., £10,000 in shares and £5000 borrowing powers.

This evidence concluded the case for the Bill. The opposition of the landowners was then proceeded with.

Mr. BAILEY, who appears for some 40 lessees, owners, and occupiers within 300 yards of the works, said he had a shrewd idea that the object of the Company was to obtain the change from a maximum-price company to a sliding-scale company. Such a change would be a rather remarkable one in itself, unless the Bill had some other provisions, such as an enlargement of area, which justified the Company coming to Parliament. From the point of view of his clients, he did not know which horse the Company were riding—viz., that the outside area was never likely to be developed, and thus the new lands would not be used for gas purposes, or that, if the lands were used for the purposes of the Company, no serious effect would be produced. It had been said that the Company would not need the land for many years; and in this state of doubt he urged that it should be put upon the Company that any gasholders that might be necessary for the purposes of the new area should be placed in that area. He would call evidence to prove that at times at present the air in the vicinity of the gas-works was permeated with the smells arising from the manufacture of gas; and he suggested that further extensions upon the existing site should be prohibited, or a clause inserted giving compensation to his clients as though a portion of their property was being taken.

Mr. *G. Sharp*, representing all the petitioners in question, spoke of the decreasing rent from certain property in which he was interested, and which he attributed to the difficulty of getting tenants due to the nuisance from the gas-works. As the Crown would not reduce the ground rent, the whole of the loss fell upon the tenants; and he anticipated still further loss if the Bill were passed. He mentioned, incidentally, the fatal effect upon vegetation of the atmosphere in the neighbourhood of the works.

Mr. HUTCHINSON, cross-examining witness, handed in a number of photographs taken close up to the works, which indicated a very healthy state of affairs in this respect.

Mr. *W. Mansfield*, interested in other property, gave similar evidence. He spoke of explosions at the works in connection with the manufacture of water gas which, he said, blew slates off the roof of the Company's premises, and sent fumes and flames up into the air to a height of 20 feet.

Mr. *N. T. Crombley*, the Solicitor to these petitioners, put in figures of population in the new area, the object being to show that the increase during the past twenty years had been exceedingly small.

Mr. ALLEN, for Mr. Stewart (another owner in the neighbourhood of the works), and Mr. FRERE (Parliamentary Agent) for the Misses Biggs, who are similarly situated, also addressed the Committee in terms identical with those set forth by Mr. Bailey.

Tuesday, April 30.

Mr. FITZGERALD opened the case this morning for the York Corporation.

Alderman *Norman Green*, the Lord Mayor of York, said he was appointed Chairman of a Special Committee to consider the Bill. The Committee decided to retain the services of Mr. E. H. Stevenson in connection with the matter. This gentleman had presented a report, in which it was recommended that the Corporation should insist upon a purchase clause.

In cross-examination by Mr. RAIKES, for the promoters, witness said that the question of purchasing the gas and water undertakings had been on the table during the past two years, and the Corporation had been advised as to the value of the gas undertaking. A factor in connection with purchase was the desire of the Corporation to have absolute control over the breaking-up of streets. Up to recently, there were three "foreign" authorities with powers to break up the streets; and there had been friction with the Gas Company. He agreed that any test without the Gas Company's representatives being present would be unfair. He did not suggest that the Company would extend mains into the outside areas if they knew the extension would be unremunerative.

Mr. FITZGERALD, in re-examination, made the point that the Company should be represented at all tests when they were liable to penalties, but the Corporation should have the right to take tests on other occasions as and when they pleased without the Company being represented.

Mr. *A. S. Rowntree*, M.P. (of the firm of Messrs. Rowntree and Co.), said his firm concurred in the opposition of the Corporation, because there was a tendency, due to the Bill, for the price of gas to be increased. In his opinion, nothing should be done at present to enhance the value of the gas undertaking without giving the Corporation an opportunity of ascertaining what action, in regard to purchase, the ratepayers would approve. It was for this reason that he supported the insertion of a suspensory purchase clause. He also expressed the view that the Bill might give greater benefits to the shareholders at the expense of the consumers.

In cross-examination, witness agreed that the proposal as to price now made was a fairer one than that made in the Bill originally.

The CHAIRMAN said he rather sympathized with Mr. Rowntree on this point, and also with the other witnesses for the Corporation, who had no doubt based their views upon the Bill as it was originally. The Committee had not yet heard at what date the change was made.

Mr. FITZGERALD said it was on April 12 that the Corporation were informed that the price had been reduced to 2s. 6d. It was not until Mr. Honoratus Lloyd opened the Bill that they heard of the neutral zone.

Witness, in re-examination, agreed that it was still possible for the shareholders to get the largest benefits, as the Company could increase the price within 2s. 2d. and 2s. 6d. without decreasing dividends.

Alderman *G. Meyer*, Vice-Chairman of the Special Committee who considered the Bill, gave similar evidence. This witness is also Chairman of the Electricity Committee; and he put in figures to show that the electricity undertaking was in a perfectly sound financial position. In 1908, the earnings upon capital amounted to 6·1 per cent; in 1909, 6·9 per cent.; in 1910, 6·7 per cent.; and in 1911, the earnings were 8·4 per cent. The so-called losses which had been mentioned were in certain years when the percentages given above were not quite sufficient to meet interest and sinking fund charges. Subject to an allowance for depreciation, the sums given above would be available for dividends if the undertaking was in the hands of a company.

The CHAIRMAN asked whether the Company could break-up streets without notice to the Corporation.

Mr. FITZGERALD said they had to give three days' notice.

Witness stated that this was practically useless to the Corporation to assist them in preventing a street being broken open for different purposes within a comparatively short time.

The CHAIRMAN: Then if the Bill goes forward without any purchase powers, are you going to make any proposal in connection with this matter?

Mr. FITZGERALD said he could not say at the moment that he was. The only question in regard to this matter was as to the depth of mains. In answer to further discussion, Counsel said he did not ask for exemption from the general law. If the Company would agree to a depth of 2 feet, he would be satisfied under the circumstances mentioned by the Chairman.

Mr. RAIKES cross-examined witness with regard to his figures on the electricity undertaking, and elicited from him the admission that the gas undertaking, which had been earning 4 per cent. for many years, would have to earn about 6¼ per cent. if money were borrowed on the same basis as for the electricity works. Thus, unless this amount were earned, the price of gas would have to be raised or the rates drawn upon. About £6000 had been drawn from the rates in aid of the electricity undertaking. Last year, however, £1600 of this had been repaid.

Mr. *Hartley*, a member of the York City Council, expressed the opinion that the Council could manage the gas undertaking as economically as the Company.

Mr. *F. Spurr*, the Surveyor to the Corporation, supported the views already expressed as to the desirability of all street openings being under the control of the Corporation. He also asked that the Corporation should have powers to indicate the position where mains should be laid in private streets.

In answer to the CHAIRMAN, witness said that, in his opinion, the general law on the whole question of laying mains should be altered.

The CHAIRMAN remarked that the suggestion that the Company should be purchased for this reason would mean the abolition of gas companies. At the same time, he quite saw the difficulty of the Corporation.

Mr. FITZGERALD said that, as a matter of fact, there were only two gas companies in existence in Scotland—in very small towns.

Mr. *E. H. Stevenson*, Consulting Gas Engineer to the Corporation, said, with the exception of Haxby and Wiggington, he did not think any of the districts in the outside area could be supplied profitably. In his opinion, the present works were enormously in excess of requirements. The water-gas plant capacity was 71 per cent. in excess of what was required at present. The coal-gas purifiers in the old works were 27 per cent. in excess of requirements, and in the new works 57 per cent. in excess; while the water-gas purifiers were 182 per cent. in excess. The present works of the Company were amply sufficient for the calls likely to be made upon them for the next twelve or fifteen years, without any additions. Assuming a 1½ per cent. rate of increase, which, in his opinion, was the right figure (he doubted very much whether it would be so high), the capital asked for would carry the Company on considerably longer than fifteen years—the City of York being practically saturated at present. Dealing with the question of the standard price, witness expressed the opinion that 2s. would be a fair figure to take. The present high price in York had been largely brought about by the sums charged to revenue during the past few years, which ought to have been charged to capital. The total he had calculated at about £33,000; and this included £23,467 spent on cookers, heaters, meters, &c. The expenditure upon new retorts ought also to have been charged to capital; and nothing appeared in the accounts for 1911 for the new service pipes and mains which the shareholders were told at the annual meeting had been laid during the year. Speaking of the Company's works, he said that he had never come across a comparatively large undertaking such as this where the methods of manufacture were so out of date. In the new retort-house, they had a very old type of retort-setting—direct fired. In the old retort-house, they had modern horizontal settings; but the coal was charged into the retorts by shovels, which was quite out of date with works of any size. In the same connection, the gas unaccounted for was very high for such a level district as York—namely, 10 per cent.; and it ought to be reduced considerably. The average was about 6½ per cent. Dealing with the question of a testing-place away from the works, witness pointed out to the Committee his reasons for suggesting that the Local Authority should have such a testing-place where they could test at any time they pleased, day or night, to see that the consumers were having gas of the proper quality. Such a provision had been allowed by Committees of the House of Lords in several cases. Carburetted water gas lost a portion of its illuminating power on its way from the mains; and the higher the illuminating power, the more it lost. About half-a-mile would be the right place for a testing-station. Under the Gas-Works Clauses Act of 1871, the Corporation could only test in winter between four and ten p.m., and in summer between five and eleven p.m. In those days, however, coal gas only was manufactured; and it was stored immediately in holders, so that a test in the evening was good enough. But now conditions were altered since the manufacture of carburetted water gas was undertaken; and he had known cases of a gas company sending out a low quality gas during the day time and making up the quality in the evening, when a test was likely to be made. This could be more readily done with water gas; and therefore it was in the interests of the consumers that reasonable facilities should be given for testing in the day time as well as the evening. With regard to the acquisition of the undertaking, the present was the most opportune time for purchase by the Corporation, as the Company had spent all their capital, and, furthermore, they were now asking for an alteration in the basis upon which they worked; and this would almost certainly enhance the value of the undertaking. At the same time, he pointed out that the shareholders would get a larger price under arbitration, or even by agreement, than they would get for their shares in the open market. Witness quoted numerous precedents where purchase clauses and suspensory clauses had been inserted in Gas Bills.

In the course of a long and keen cross-examination by Mr. HONORATUS LLOYD, witness admitted that, although he had made precisely similar arguments in favour of purchase in the case of the Fleetwood Gas Bill this session, a House of Commons Committee had refused to put in a clause. He expressed hopes, however, that he would be successful in the next House. He denied that he himself originated the idea of purchase at York, and said that members of the Corporation had suggested it in conversation before his report was presented to the Council. It was pointed out that in his report witness suggested that the Corporation should ask for the Mexborough and Swinton clause, which was an absolute purchase clause.

Mr. FITZGERALD remarked that this was so, but called attention to the case of East Hull, where a suspensory clause, preventing the Company from putting their Bill into force for a certain period, in order to give the Local Authority an opportunity to purchase, was inserted. Such a clause, he said, did not prejudice the Company in any way; and he would be content with it.

Mr. HONORATUS LLOYD, continuing his cross-examination of witness, suggested that the Corporation had now shifted their ground, and that they wished to be able to go to the ratepayers with the suspensory clause, and suggest that it was an invitation to purchase, and in this way get the ratepayers' consent.

Witness: That is not the intention of the Corporation.

Mr. HONORATUS LLOYD: But is not that the use usually made of such a clause?

Witness: No, I do not know of any case of the sort.

Mr. HONORATUS LLOYD: You astonish me. At any rate, if the clause is inserted, the Company get half a hearing this year and none at all next year.

In the course of further questions, Counsel pointed out that if the present occasion had been a straight fight upon the question of

purchase, the Company would have gone into all the finances of the Corporation.

Witness was next questioned as to the desirability of extending the works on the present site. He expressed the opinion that they should not be extended, and hinted that they should be removed. He was reminded by Counsel that not a bit of this was mentioned in his report; but he said he would strongly advise the Corporation to remove the works if they ever purchased the undertaking. It was a point which he had overlooked in his report. In connection with witness's opinions that £400 per million cubic feet would be sufficient for future extensions if any were needed, that 1½ per cent. increase could be looked forward to in future, and that a 2s. standard price would be fair, Counsel carried on a somewhat searching examination, in which he pitted witness's professional reputation as a practical gas manager against that of Mr. Corbet Woodall, whose figures were different. Witness, however, maintained that he had gas-works under his control; but that in one case only—Hunstanton, which had an output of 18 million cubic feet, and where he had reduced the price from 5s. to 3s. 6d—was he in actual charge. He maintained that it was the practice of Parliament, in fixing a standard price under the circumstances of the York Company, to take the existing price and allow a reasonable margin where the existing price was a fair one; but at York it was not a fair price, for the reasons he had stated—as to capital expenditure being made out of revenue, and so keeping the price up. Mr. Honoratus Lloyd put it to witness that the Local Government Board insisted upon local authorities purchasing meters, cookers, and stoves out of revenue Witness, while admitting that he did not know this, said he did not agree with it, and maintained it was not the right thing to do. Further cross-examination of a keen character took place in respect of the amount which should be charged to repairs and maintenance of works, mains, meters, and stoves. Witness would not agree that this was one of the most debatable points of discussion between gas engineers, and said that he had never been in any case where the difference in dispute was much more than a halfpenny; but Counsel said he knew of cases where opinions had differed as between about 6d. and 9d.

Mr. FITZGERALD, in his speech for the York Corporation, dwelt at length upon the original terms of the Bill as to price, and pointed out that the change indicated by Mr. Honoratus Lloyd in his opening speech had only been made after the report of the Local Government Board had been seen.

Wednesday, May 1.

Mr. FITZGERALD continued his speech this morning, and argued that, contrary to the provisions of the Gas-Works Clauses Act, 1871, the Company had undoubtedly taken capital expenditure out of revenue; and this being so, some reduction in respect of it must be made in arriving at the standard price as compared with the figure at present charged. What had actually been done was to take sums out of revenue. They had made an entry for depreciation, and then called it capital account; and this was contrary to the terms of the Act. The only depreciation fund allowed on revenue account under the Act was in respect of works on leasehold lands. Such an action was a mere device for diverting profits from the pockets of the consumers. Clause 35 laid it down clearly that gas companies' accounts were to be made out according to the form prescribed in the Act; and what had been done was wholly illegal. During 1910 and 1911, the sum of £6700 had been charged to revenue in respect of new meters, cookers, &c.; and a similar thing had been done with regard to the new retorts. Where, he contended, a company were putting in new retorts in place of old ones, they were entitled to charge the cost of the old retorts to revenue; but the cost of the new retorts was a capital charge. The Corporation claimed that an amount of 2·19d. should be deducted from the proposed standard price in respect of this capital expenditure in the past. Another factor which should be taken into account was the test-burner. He contended that, in addition to getting the reduction of 1½ candles—viz., from 15½ to 14 candles—there was an additional advantage of 2 candles by the change of burner; the modern test of 14 candles being that giving 12 candles under the test hitherto adopted by the Company. On this account, he took ⅜d. per candle, agreed to by witnesses for the Company, giving a further reduction of 1·31d. The suggestion of a neutral zone was really an admission by the Company that the present price should be the standard; and after making the deductions mentioned above, the figure was brought below 2s. The Corporation, however, felt that 2s. would be a fair price to adopt. The application by the Corporation for a purchase clause was by no means an uncommon thing; for out of 300 gas-works owned by local authorities, the majority had been transferred from companies. But he was now only asking for a suspensory clause to enable a purchase Bill to be promoted next year without any alteration in the circumstances of the Company. At present, the Company was a maximum-price concern; and nothing was more simple than to fix the price of such a company by arbitration. If the Company were changed to a sliding-scale one, very many factors entered into the question, which made the determination of the price a much more difficult matter. Further, if transferred as a maximum-price Company, the reserve fund of £25,000 would go to the purchasing authority; whereas as a sliding-scale company, under the Bill it would belong to the Company.

The opposition of the United Alkali Manufacturers' Association was then taken.

Dr. *R. Messel*, a Director of Messrs. Spencer Chapman and Messel, a Vice-President of the United Alkali Manufacturers' Association, was the first witness. He reiterated the views already expressed in connection with the other Bills where this question was threshed out.

Mr. RAIKES, in cross-examination, indicated that there were no small companies in the neighbourhood from whom the York Company could purchase residuals; and therefore they could not enter into the competition complained of. Witness said he knew nothing about the circumstances of the York Company's district, and that he had no complaint to make against the York Company. He was there giving evidence in the interests of the chemical industry, one portion of which would undoubtedly be extinguished unless the protection asked for were obtained.

Mr. FITZGERALD, in re-examination, made the point that the York Company had no power at present to deal in residuals except their own, but were taking powers to do so for the first time in this Bill.

Mr. *W. R. Herring* supported the position taken up the Alkali Manufacturers' Association. He repeated his opinions that it was not in the interests of the consumers that gas undertakings should enter into the speculative business of chemical manufacture, any loss from which would fall upon the consumers as well as the shareholders.

The CHAIRMAN: Is this practice a new one?

Witness: It is only developing. There is a tendency now for certain gas undertakings to go more largely outside the general scope of the gas industry. It is within the last ten years that it has developed.

The CHAIRMAN: The point is that if it is so objectionable, how is it that you have only just discovered that it is objectionable?

Witness: If it has only just sprung up, that would be the answer.

In cross-examination by Mr. RAIKES, who asked for the name of a company doing what was complained of, witness said he believed the South Metropolitan Company did. He could not give any other name. His knowledge on this point was gathered from what he heard before Lord Ritchie's Committee on the South Suburban Gas Bill; but this did not alter his opinion as to the general principle. As to the spirit behind the opposition, he pointed out that the United Alkali Manufacturers' Association was upon the same basis as the Gas Companies Protection Association—it was formed to watch over a particular industry. The latter Association was taking great interest in the present question, and was calling upon its members to oppose the Alkali Manufacturers' Association.

Mr. FITZGERALD said he had several other witnesses; but as they would only give similar evidence, he thought the case was sufficiently before the Committee. He then addressed the Committee in support of the Alkali Manufacturers' Association, explaining the position already fully reported in our columns. In conclusion, he asked the Committee to insert the clause which Lord Ritchie's Committee inserted in the South Suburban Gas Bill.

The CHAIRMAN asked if the Company took powers under the Bill to do what was objected to.

Mr. FITZGERALD said clause 41 used such general words that it might be doubtful whether it gave the powers or not.

Mr. RAIKES asked where, in the clause, any authority was given the Company to "buy" raw materials.

Mr. FITZGERALD said that the words "provide, supply, and deal in" gave such a power.

The CHAIRMAN said it seemed to him that the promoters must either say that they had not the power and did not propose it, or that they do not contemplate doing anything objected to.

Mr. FITZGERALD said that the matter had already been dealt with this session in some twelve Bills, and in every case a clause giving some protection to the Alkali Manufacturers' Association was inserted. In some Bills the clause was agreed, and in others it was inserted after discussion before Committees.

The CHAIRMAN, before the final speech on behalf of the promoters was made, said that, at the moment, the Committee were inclined to give this new clause; but, of course, they would like to hear the promoters first.

Mr. RAIKES, who commenced the reply, dealt with the alkali question, and argued that it was an attempt on behalf of a trust to keep up prices. Further, the circumstances of this Company were such that it would be unreasonable to insert the clause just because it had been put into other Bills, whether opposed or not. His view was that clause 41 did not give the Company the right to purchase residuals; and it was clear that Mr. Fitzgerald was merely anxious to add one more precedent which he could place before other Committees in the future, when he would say that, even in a case where it was doubtful whether the Company had the powers or not, this Committee took such a strong view of it that they allowed the clause to go in. At this point,

Mr. HONORATUS LLOYD took up the reply on the general part of the Bill. He laid stress upon the fact that the Company had carried on their business for so many years without any suggestion of a complaint, and maintained that no strong case had been made out for refusing what the promoters were asking. Dealing with the allegation that sums had been spent from revenue on capital account, he pointed out that, until two or three years ago, the accounts showed the gross amount of capital expenditure, then a deduction was made for depreciation, and finally the net amount spent on capital account was shown. In the last two years, only the net amount had been shown. And what was wrong with this? As to the question of the retorts, these had been renewed four times. If all these had been charged to capital, they would have had all this dead-weight on the capital account; and to suggest a deduction of 2·19d. from the proposed standard price on account of this was most unjust. Then as to the neutral zone——

The CHAIRMAN: I am rather puzzled about that. Assuming that we were to grant this neutral zone, where is it to begin and end? You would be in a position to charge 2s. 6d. at once, although you would not be able to increase your dividend, and you would be in a position of advantage over what you are now.

Mr. HONORATUS LLOYD: We should gain nothing by it.

The CHAIRMAN: No; but the consumers would lose by it.

Mr. HONORATUS LLOYD said the whole object was to give the Company an inducement to reduce the price as low as possible, in order that they might divide more profits. They were bound to carry on the business in a commercial way. They could charge 3s. 6d. to-day; but it would not be a commercial transaction. Finally, he objected to any purchase clause, suspensory or otherwise, going into the Bill, for the reasons he had indicated in the course of the proceedings.

Thursday, May 2.

This morning, the Committee gave their decision.

The CHAIRMAN said the Committee had come to the conclusion that, if the Bill was to proceed, they must insist upon certain restrictions and certain conditions, which he would explain as briefly as possible. In the first place, if the whole of the additional area were to be granted, it could not be granted unconditionally. The Committee would be willing to accept some provision on the lines of that already accorded to one of the parishes as to a time-limit within which mains should be

laid. The object of the Committee was not to grant a monopoly in this large district for such a length of time as might be necessary before the promoters again came to Parliament. Five years was the period given to one authority; and probably the ingenuity of Counsel, assuming that the promoters went on with the Bill, would enable them to prepare a clause which would extend the restriction to the whole of the area.

Mr. HUTCHINSON said he presumed the Chairman had in mind the clause in the filled-in Bill for protecting the Weatherby district.

The CHAIRMAN replied in the affirmative. Continuing, he said that, with regard to additional land, the Committee were not disposed to grant the whole of the proposed land for extending the gas-works, but would be prepared to grant the lower half, if the promoters were prepared to accept this.

Mr. HUTCHINSON: If you please.

The CHAIRMAN said he did not know if he was right in making a suggestion on his own account, but it was that, if the Company wanted further land, they might take the rest of the lower half up to the railway. Then, as to the question of capital, the Committee had decided that, if the capital powers asked for were to be granted, they must be on the basis of 6 per cent, and not 7 per cent., stock, and that the auction clauses must apply to the loan as well as the share capital. Coming to the question of the standard price, after very careful consideration the Committee had decided not to accede to the proposal of a neutral zone. They considered that the standard price should be 2s. 3d. In regard to the testing-stations, there was no objection at all to allowing the Corporation to have a testing-station, provided they had it at their own expense and not at the expense of the Company, and also on condition that the Corporation undertook to give notice to the Company when they proposed to test, so as not to take tests behind the Company's back. There was only one more point; and that was the petition of the Alkali Manufacturers' Association. The Committee had determined that the clause which was inserted by Lord Ritchie's Committee in a previous Bill must be inserted in this one. Subject to these conditions, the preamble of the Bill was proved, and it might proceed.

[It will be noticed that the proposed purchase by the Corporation is ignored in the above decision; and thus the Corporation do not get the desired suspensory clause.]

Later in the day, the consideration of clauses was commenced; the promoters accepting the conditions laid down by the Committee.

Friday, May 3.

Clauses were discussed this morning. A request by the Corporation that the mortgage stock should be subject to the auction clauses was rejected by the Committee; it being strongly urged by the promoters that to make this stock liable to auction clauses would render it impossible to raise any money in this way, and that, in fact, this had happened in other cases.

With regard to the present reserve fund, amounting to £23,000, which is now liable to be used for equalization of dividends and also for any sudden expenditure, such as, for instance, said Counsel for the Corporation, a coal strike, under the new conditions of a sliding-scale company, the Bill enabled two funds to be raised—viz., a reserve fund and a special purposes fund. The promoters suggested that the whole of the £23,000 should be placed to reserve fund; but the Corporation asked that it should be divided between the new reserve fund and the special purposes fund.

Mr. HONORATUS LLOYD, for the promoters, strongly opposed, on the ground that what was proposed was the usual practice. He said there was no obligation on the Company to pay special expenditure out of the existing reserve fund. It could have been met in the past out of revenue, in spite of the existence of the reserve fund.

Mr. BAYLEY, for the Corporation, urged that the existing reserve fund had been taken from revenue, and therefore had partly come out of the pockets of the consumers. This was the ground of his contention for the division in the way he had suggested.

The Committee decided that the promoters' proposal should stand, and that the fund should not be divided.

The next suggestion by the Corporation was that an independent Auditor of the Company's accounts should be appointed and should be suitably remunerated by the Company. Perhaps he might be appointed by the Board of Trade. This was the practice under the Electric Lighting Acts.

The CHAIRMAN wanted to know if this was done in the case of any other gas company.

Mr. BAYLEY said he did not think so. He merely wished to retain the independent Auditor, who was at present appointed by the Recorder of Sheffield, and whom the Company wished to get rid of.

The CHAIRMAN said that in 1844, when the Special Auditor was allowed, the Gas-Works Clauses Act had not been passed, and it might then have served a useful purpose. Would it be useful to retain him under modern conditions? And if it was desirable at York, was it not desirable in every other gas company?

Mr. BAYLEY's reply was that a start must be made somewhere, and, as a matter of fact, the Corporation really had the right now which they did not wish to lose. They did not care who appointed the Auditor so long as he was independent of the Gas Company.

Mr. HONORATUS LLOYD said the Chairman had summed up the position precisely as it was. He agreed that there were cases where a special auditor was appointed. He instanced the case of the Gaslight and Coke Company; but that was very many years ago, and under very special terms indeed. There was another case in the Potteries—viz., the British Gaslight Company, who had works in various parts of the country, and in consequence there was some difficulty in seeing which part of the whole accounts of the Company related to the Potteries. Hull and Norwich were also supplied by the British Company; and an auditor was allowed in these towns as well. The circumstances, however, were in no way similar to those at York. Parliament had already prescribed the way in which the accounts were to be audited, and there was no evidence that the general law was insufficient. Under special circumstances, also, auditors had been appointed at Brighton and Gosport. At the latter place, it was shown that the Company distributed dividends more than they were entitled to.

The CHAIRMAN was in doubt as to whether gas companies generally were bound to have their accounts audited.

Mr. HONORATUS LLOYD said the Companies Clauses Consolidation Act provided for this.

The CHAIRMAN said the Committee could not grant the independent auditor.

The Corporation next asked for a modification of clause 43, which provided for an increased price of 6d. in the enlarged area compared with that charged in the existing area, if the Company thought fit. In the interests of the consumers in York, it was asked that the price must always be 6d. more outside than inside.

Mr. HONORATUS LLOYD characterized this as legislating backwards; the general tendency nowadays being to allow a company to charge at a uniform rate to the districts further off in the interests of the consumers nearer the works, as the extra consumption reduced the cost of manufacture. At any rate, the furthest they should go was to enable the Company to make the extra charge, if necessary.

The proposal of the Corporation was rejected.

An amendment to clause 46, prescribing that the Corporation might test between 10 a.m. and 10 p.m., and also increasing the penalty from 40s. to £5, was the cause of some deliberation on the part of the Committee; the room being cleared.

The CHAIRMAN eventually announced that the Committee thought it reasonable that the Corporation should have power to test during the daytime; but they refused the right to test at all times. They suggested that tests might be carried out between nine and twelve in the morning and seven and ten in the evening; but the latter time was afterwards altered to give the ordinary hours as provided in the Gas-Works Clauses Act.

Mr. BAYLEY, for the Corporation, next asked that the Company should be prevented from storing, as well as manufacturing, gas on lands to be bought by agreement.

Mr. HONORATUS LLOYD said the general law provided for this, inasmuch as he had to get consents from all occupiers within 300 yards.

The Committee rejected the amendment, as they did also a suggestion that any fines for stealing gas should not go to the Company but to the general exchequer.

The final point raised on behalf of the Corporation was as to the control of streets in connection with the laying of gas-mains. The Corporation asked for control of private streets in regard to this matter; it having been held, in the Courts, that during the period until the street was handed over to the Corporation nobody had any control over the laying of mains in them. This state of affairs might prejudice the laying of sewers at a subsequent date when the roads were taken over by the local authority, unless the Corporation had some voice as to the position of gas-mains.

Mr. HONORATUS LLOYD said this was another attempt to suggest that the protection afforded by the Gas-Works Clauses Act was insufficient. He had fought the question over and over again, and did not know of a case where the proposal had been adopted against the wish of a company. At present, the ordinary law of the land provided for all the contingencies set out in the long clause suggested by the Corporation.

The CHAIRMAN said the Committee would be influenced if it could be shown that difficulty was always arising; but under the circumstances, they refused the proposed clause.

This completed the consideration of the Bill, which was ordered to be reported for third reading.

CHRISTCHURCH GAS BILL.

The Bill promoted by the Christchurch Gas Company, the objects of which are to extend the area of supply, construct new works, raise additional capital, and modernize the provisions under which the Company are at present carried on, was disposed of last Tuesday, by a Lords Committee, presided over by the Marquis of BRISTOL.

The Hon. EVAN CHARTERIS appeared for the promoters. There were only two opponents, occupiers of houses adjacent to the proposed extension of works—viz., Messrs. Moser (represented by Mr. COURTHOPE MUNROE) and Mr. Tilney Barton, who appeared in person.

The Hon. EVAN CHARTERIS, in opening, said that the Company was incorporated in 1877 with a capital of £35,000, all of which had been issued, with the exception of £6920. In the Bill, powers were sought to issue this latter amount, with the alteration that it might be issued under the auction clauses as 7 per cent. ordinary stock or 6 per cent. preference stock, instead of as 10 per cent., as could be done at present. In addition, further capital powers amounting to £30,000, with one-third borrowing powers, were asked for. Owing to the defects of the present gas-works site, they had been compelled to seek further lands at New Milton. The present site not only involved the cartage of coal some distance from the railway station, but was also liable to be flooded at times. Originally the Bill contained a maximum price of 6s. 6d.; but an agreement had been made with the local authorities to reduce this to 5s. in Christchurch and 5s. 6d. outside. A point of interest in the Bill was clause 2, in connection with which the Home Office had reported. The clause was as follows:

> In their application to the Company, the provisions of the Gas-Works Clauses Act, 1847, shall be modified as follows: Any tunnel, arch, vault, or building situate beneath the surface of any street within the limits of the Company for the supply of gas shall, for the purposes of the Act of 1877 and of this Act, be deemed to be a tunnel to which the provisions with respect to the breaking-up of streets for the purposes of laying pipes apply, and shall not be deemed to be a building within the meaning of section 7 [not to enter on private land without consent].

The Home Office said there was no precedent for such a clause, and pointed out that it involved an important alteration in the general law in favour of one particular company. In reply to this, Counsel said the genesis of the clause was the High Court's decision in the recent case of *Schweder v. Worthing Gaslight and Coke Company*, which

held that a tunnel bored as a passage-way under the highway was a building within the meaning of section 7 of the Gas-Works Clauses Act. In that case, the tunnel was built with the object of preventing the Gas Company from laying their pipes in front of Mr. Schweder's house; and it was obvious that, under this decision, an owner of property on both sides of a thoroughfare might deliberately make a tunnel under the road in such a way as to render it impossible for gas-pipes to be laid. However, he understood that the question was being considered by the Lord Chairman; and he suggested that the Committee should not express any opinion on the clause now.

Evidence was given on behalf of the Bill by Mr. *William Cash*, Mr. *Harry Woodall*, and Mr. *Harold Woodall*.

After hearing the case for the two petitioners, who asked for compensation,

The Committee passed the preamble of the Bill, refusing compensation, and left over the question of clause 2.

ASHBORNE URBAN DISTRICT COUNCIL GAS BILL.

The Bill promoted by the Ashborne Urban District Council, having for its object the transfer of the undertaking of the Ashborne and District Gas Company to the Council, was on April 25 before the Unopposed Bills Committee of the House of Commons presided over by Mr. WHITLEY, and was ordered to be reported for third reading, with amendments.

Mr. CRIPPS (Messrs. Dyson and Co., Parliamentary Agents) was in charge of the Bill.

In answer to the CHAIRMAN, as to why the Council desired to have the control of the gas-works, it was stated that, in the first place, there had been trouble with the Council's control of the roads, which it was desired to avoid; and, secondly, a large number of industries were coming to the town, and it was felt that more could be attracted if the supply of gas was in the hands of the Council.

The CHAIRMAN next drew attention to clause 19, which gives power to charge a differential rate as between Ashborne and the districts outside which are within the limits of supply. It was the Committee's duty to look after these districts, and see that they could get proper terms in the future. At present, there was no power to ask for any revision of price.

Mr. CRIPPS remarked that the Councils outside had the right to purchase the portions of the undertaking in their areas if they were dissatisfied.

The CHAIRMAN said it was clear that villages such as these outside districts were could not carry on a gas undertaking, and they ought to have the right of appeal to the Local Government Board on the question of price. At present, there was nothing to prevent the Council from keeping the price high, and applying the profits from the outside area for the benefit of Ashborne.

Mr. CRIPPS replied that under the Bill the price had to be reduced outside if it was reduced inside the area.

After further discussion, it was ultimately decided to limit the borrowing powers under the Bill to £5000 for the extension of the works (the amount was unlimited in the Bill), thus forcing the Council to come to Parliament again within a comparatively short time, and giving an opportunity for the outside authorities to oppose if the undertaking has not been carried on to the satisfaction of the consumers in their areas. The period for the repayment of the loan for new works was fixed at 28 years, with 35 years for the repayment of the loan for the purchase of the Company. Clause 21, providing for prepayment of gas accounts in certain cases, has been withdrawn; while clause 22, which, as drafted, would have allowed a discount of 25 per cent. for prompt payment being allowed to all consumers, has been altered to read "10 per cent. discount for prompt payment and a discount of 25 per cent. in the case of extra large consumers."

Supply of Gas to Disley from New Mills.

At last week's meeting of the New Mills Urban District Council, the members had under consideration the Local Government Board's draft Provisional Order to amend the Council's Act of 1906 to enable them to supply gas to Disley. With regard to a clause relating to the differential charges for Disley, providing for a reduction of 2d. per 1000 cubic feet after March 1, 1923, it was explained in the correspondence of the Local Government Board that the insertion of this provision must not be regarded as a condition of the extension of the gas limits, and that it will be open to the Council to apply to the Board before that date for the issue of a Provisional Order to amend or modify the provision, if it should be found that the revenue of the Council for the supply of gas in the added area is such that the reduction in the differential charge would be inequitable. After some discussion, the draft Order was approved. The agreement between the New Mills Council and the Disley Council provides that the maximum price for gas consumed in Disley will be 3s. 3d. per 1000 cubic feet, or 9d. more than is charged to consumers in New Mills. But if the consumption exceeds 6,000,000 cubic feet, there will be a reduction of 2d. per 1000 cubic feet; for 8,000,000 cubic feet, a reduction of 4d.; and for 10,000,000 cubic feet, a reduction of 6d.—bringing the price to 2s. 9d. It is also agreed that if the price of gas is reduced at New Mills the consumers in Disley will receive a corresponding reduction.

Heywood Corporation Gas Profits.—The net profit on the working of the Heywood Corporation gas undertaking for the past financial year was £1580, against £1147 in the preceding twelve months. This has been accomplished despite the fact that rates have increased by £140 per annum, and that there is a reduction of £200 in the amount received on street lighting account, brought about by the reduction in the price of gas. The Gas Committee recommend to the Council that £580 be taken from the profit earned in relief of rates, and the balance left for the purposes of the Gas Department. Last year the amount handed over in relief of rates was £700.

MISCELLANEOUS NEWS.

EXAMINATION IN "GAS SUPPLY."

The City and Guilds of London Question Paper.

In the "JOURNAL" last week, we gave (p. 311) the questions set by Mr. Thomas Glover, of Norwich, the Examiner in the "Gas Engineering" examination held at the City and Guilds of London Institute on the 27th ult. We are now able to give the questions set by Mr. Walter Hole, of Leeds, in the "Gas Supply" examination held last Saturday. As on the previous occasion, the candidates were directed to confine themselves to one grade only, and not more than eight numbered questions were to be attempted in the four hours allowed. The numbers at the ends of the questions are the maximum marks obtainable.

HONOURS GRADE.

1. State what you know of the factors which determine the rates of discharges from pipes. Calculate by means of Dr. Pole's formula the discharge from 1000 yards of 10-inch main with an initial pressure of 3 inches head of water and a discharge pressure of 2·7 inches head of water, with gas of a density of 0·4 (air = 1). [34.]

2. What do you understand by "boosting"? Discuss its advantages and disadvantages as compared with the alternative. Sketch in outline any simple boosting plant with which you are familiar, showing the whole of the connections and necessary valves. [32.]

3. What considerations would determine for you the general character of the lighting of the sick ward of a hospital? How would you place the lights in relation to the beds and nurses' tables. Describe, with sketches where necessary, any devices, apparatus, or fittings of a special character which you would employ. [36.]

4. What is meant by the illumination curve of a lamp? Draw the approximate half lower hemispherical curve of an inverted burner giving a light equal to 60-candle power on a horizontal line taken through the mantle, and calculate its mean lower hemispherical candle power. [32.]

5. What, in your opinion, are the essentials of a perfect gas-fire suitable for domestic use? Describe, with sketches where necessary, how these essentials may be secured in actual practice. [38.]

6. Discuss the relative advantage of high-pressure and high-power low-pressure lamps for outside shop lighting, and sketch a sectional elevation through any lamp of either kind with which you are familiar, stating the make of lamp your sketch illustrates. [38.]

7. (*a*) What faults, troubles, or difficulties may arise in the ordinary working of a gas-engine of moderate size—say, 10 to 20 H.P.? State precisely how you would act in each case. [32.]

or, (*b*) State precisely how you would deal with a badly-gassed workman when immediate medical aid is not available. [32.]

8. The subjoined plan shows a portion of a principal thoroughfare in a large town. The street is 70 to 75 feet wide from building-line to building-line, and the footpaths on each side are 12 feet wide. Large shops abut upon the street on both sides. A passenger refuge is marked A on the plan. You are required to light this thoroughfare with high-pressure gas-lamps. Mark on the plan where you would place the lamps, and state: (*a*) The candle power of the lamp you would employ. (*b*) The height above ground level at which you would fix the lamps. (*c*) How far apart the lamps should be. (*d*) How you would support the lanterns. (*e*) On what basis you have made your calculations. [42.]

9. Assume that you are required to plan the heating with gas of a lecture hall 70 feet long, 35 feet wide, and 16 feet high to the eaves; the apex of the roof being 9 feet vertically above the line of the eaves. The hall is lighted by a 15 ft. by 12 ft. leaded window at one end, and a circular leaded window at the other end 8 feet in diameter. In addition, there are two windows, each 5 feet square, upon each side of the hall. There are four entrances—two from inner corridors, and two from lobbies communicating with the street outside. There is no gallery in the hall. The maximum heating capacity required is 20° Fahr. above the outside atmospheric temperature, and the air of the room is to be entirely changed six times every hour. Describe what means you would adopt to heat such a hall, and give your reasons. On what basis would you calculate the requirements; and at what expenditure of gas per hour could your plan be carried out? [42.]

10. Describe any system of lighting and extinguishing public lamps by means of pressure-wave transmission with which you are familiar. Show by means of sketches the necessary apparatus, and state the pressure needed to work it. [38.]

ORDINARY GRADE.

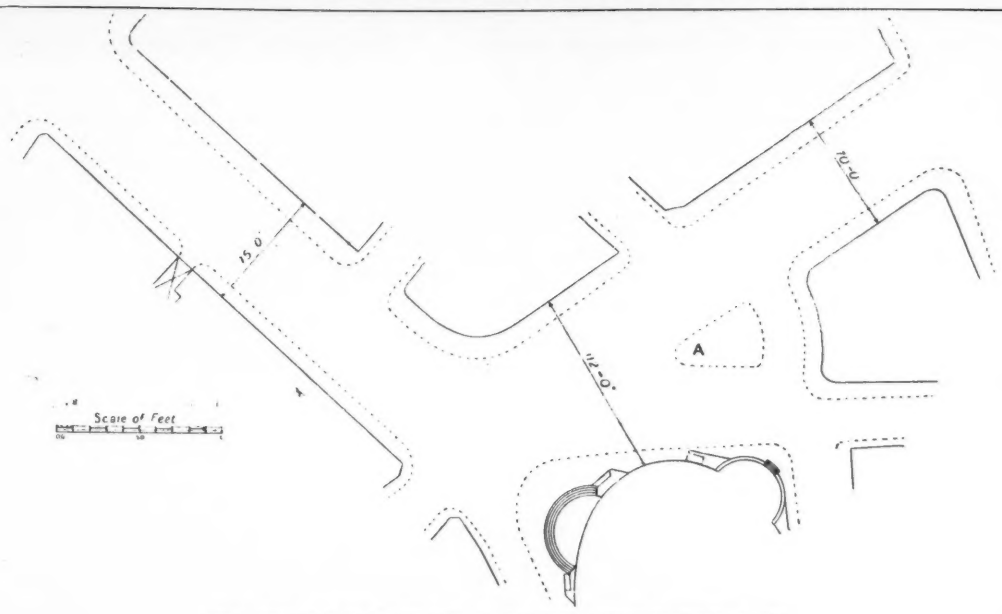
1. (*a*) What are the characteristics of a good cast-iron pipe? How would you find out whether a pipe is equally thick all round without cutting it? [32.]

or, (*b*) What is compo. pipe? Discuss the relative advantages of compo. and wrought-iron tubes for (1) piping a building in course of erection, and (2) carrying out extensions in, or first fitting of, an old residence. [32.]

2. You are required to insert a 12-inch branch in a 24-inch main. State in detail how you would proceed when (*a*) using an ordinary tee, and (*b*) using a Ruscoe split tee, assuming that the necessary excavation has been made in each case. Which method do you prefer, and why? [42.]

3. Along a certain roadway the gas supply to the various premises is observed to oscillate at night, while no trouble is experienced during the daytime. What would you suspect was the fault, and how would you proceed to locate it? Why should the effect be different at night and in the day? [32.]

4. (*a*) In searching for an escape, suppose that you have found a broken service-pipe under a concreted and paved roadway. State precisely how you would deal with it (1) temporarily, and (2) permanently. [32.]



Plan referred to in Question No. 8—Gas Supply, Honours Grade, p. 386.

or, (*b*) State exactly how you would proceed to locate a very small escape of gas at a consumer's residence. [32.]

5. Describe in detail the four operations known as the Otto cycle in the working of a gas-engine. Show exactly how the charge is fired by means of tube ignition. What general advantages has a gas-engine of moderate power (say 10 H.P.) over a steam-engine of equal power? [42.]

6. Assume that you have a gas-heated circulating hot-water boiler to fix as a supplement to the hot-water circulating system (heated from the kitchen range) of a house. Describe and show exactly how you would connect-up. Describe any apparatus which may be used to prevent unnecessary consumption of gas. [36.]

7. What are the essentials of a good street lantern? Draw a sectional elevation of the best you know adapted for a single low-pressure burner. State the make of lamp which your sketch illustrates. [38.]

8. In fixing a gas-fire, what precautions would you observe in order to secure satisfactory results? How would you deal with a chimney having (*a*) no natural draught, (*b*) a down-draught? [38.]

9. Which do you consider the better for ordinary household lighting, the upright or the inverted incandescent burner? Give your reasons. Draw a sectional elevation through the burner of your preference. [34.]

10. Why should gas supply be maintained at an even and regular pressure? Describe and draw a sectional elevation through any apparatus you would use near a consumer's meter to prevent fluctuation of pressure. [38.]

PRIMITIVA GAS COMPANY OF BUENOS AYRES, LIMITED.

The Annual Meeting of this Company was held last Tuesday, at River Plate House, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. J. M. Macmorran) having read the notice convening the meeting,

The CHAIRMAN apologized for his presence in the chair, in the place of Mr. Bowen, who, he said, was in Buenos Ayres, as was also Mr. C. P. Ogilvie. Mr. Bowen had sent some notes of the view he took of the shareholders' interests, which he would call on the Secretary to read; and he would confine himself at this moment to reminding the proprietors that on the last occasion on which they met, the Directors had to tell them what a very busy year they had had in arranging the new Company, and how the Board had had to be engaged in most anxious and grave matters. At the present time they had just emerged from a very serious strike affecting the receipt of the raw material which was so necessary to the Company—namely, coal—and another strike on the spot in the transport industry, where they had very able assistance from the Municipality. Thus it would be understood that their bed was still not entirely one of roses. As he was speaking to, perhaps, one of the earliest meetings held after the termination of the terrible coal strike that they had been suffering from in this country, which had affected all the companies who obtained their raw material from England, he thought the shareholders would agree with him that, when the Board met them there, and told them that, in spite of these difficulties, the supply of gas had been maintained in Buenos Ayres in the best and most perfect condition (as they had seen it maintained in England in the chief and most important cities and towns), to have faced such an emergency and overcome it, as they had done, without the consumers at home and abroad suffering much inconvenience, showed that the directors of gas companies generally had risen nobly to their responsibilities. He would now call on the Secretary to read Mr. Bowen's observations.

The SECRETARY then read the following:

"The task of re-organization, to which I referred at our last general meeting, and which I then hoped was almost completed, has been continued during the year 1911; and it was found much more difficult than we anticipated when we arranged the amalgamation of the three Companies. So difficult was it, that we found it necessary to entirely change the management in Buenos Ayres. The new management has been in charge only for the last quarter of the year 1911; but we have every reason to think that it will be entirely successful. I am able to say that our information is to the effect that everyone is now working well and in the most loyal manner; and I hope on my return from Buenos Ayres that I shall be able to report to the Board that everything is quite satisfactory. Owing to our obligation to hand over the Retiro works to the Municipality, we have had to put up at Palermo a large new gasholder, with a capacity of 4½ million cubic feet. This has just been finished, so we are at last able to demolish the old holders at the Retiro works, and complete our contract with the authorities. As we state in the report, the profits for the year were very unfavourably affected by the high rates of freight we had to pay on our coals and materials; and when I tell you that our coal freights alone cost us £22,950 more than in the preceding year (and this, you will remember, is on top of an increase in freight rates of £35,000 during the year 1910), you will see that we may hope that future comparisons will be more in our favour than during the last two years. Our selling prices of gas being fixed by our contract with the Municipality, we alone have to bear these high freight charges; and we cannot obtain any help from our customers. You will, of course, want to know how we stood as regards coal when the disastrous strike broke out in England. We were not very anxious, as we had fully four months' supply, and we were fairly certain of getting coal from one direction or another, if we could not get it from England. I may mention, incidentally, that we bought coals both from America and Australia. We were also greatly troubled during the year by local strikes; but with the aid of the municipal and national authorities, we were able to keep the works going. I should like here to put on record our recognition of the services rendered to us by the authorities in Buenos Ayres, who lent us not only men, but horses and carts. Without the help thus given us, we should have had, if not to entirely close-down, at least to have very much reduced our output of gas. You will see from this that our relations with the authorities are perfectly amicable and satisfactory in every way. Our business is flourishing; but we have had a little falling off in the private consumption of gas, possibly owing to the fact that the new filament lamps, introduced by the Electric Company, have induced people to prefer this system of lighting. I am glad to say that this falling off appears to have ceased; and we are now getting better returns. On the other hand, the demand for cooking-stoves and heating appliances is better than ever; and it takes us all our time to keep pace with it. I do not know that there is any other general information to give you; but you will perhaps like to go through the salient points of the balance-sheet and profit and loss account. The amount spent on capital during the year was £119,654; and, as you will see by the report, this is represented by an increase of over 28 miles in our network of 1040 miles of mains, and 1578 additional consumers and 10,408 services. To obtain this capital, and to put our balance-sheet in proper order, we sold during the year £145,000 of 4 per cent. debenture stock, and 5000 of our ordinary shares. The debenture stock was sold at a small discount, and the ordinary shares, of course, at a good premium. The premium on these shares, less the discount on the debentures and the expenses of issuing them, was £41,055; and this has been carried to the general reserve account. We ask you to authorize us to add a further £18,944 out of profits, bringing the total to £90,000, which, I think, is not bad, considering we are only dealing with the second year of the present Company. The other items on the debit side of the balance-sheet do not call for remark from me, and I think the items on the credit side are all clear. But I should point out to you that we have again written off £35,000 out of profits to the Retiro works amortization account. When speaking of reserve funds, I should mention that we have also provided out of profits for the sinking funds of the River Plate and Buenos Ayres (New) debenture stocks, £6321. In regard to profit and loss, debenture interest, of course, shows a slight increase. London office expenses are lower to the extent of £6946, principally owing to the fact that our income-tax outgoing is less than in the preceding year. The revenue account is down £21,166; but the profit on exchange, less discount and stamps, is up some £1514. This leaves us with a total sum to the credit of profit and loss of £352,698, to which has to be added the amount brought forward from the last account—namely, £56,494—which gives a total of £409,192. After deducting debenture interest, sinking funds, the London office expenses, with depreciation on furniture and investments, £23,155, and the two dividends paid on the preference shares, as also the interim dividend of 3s. 6d. per share on the ordinary shares, it

leaves to be dealt with £164,131; and out of this we recommend a final dividend of 4s. 6d. per share, less income-tax—making a total distribution of 8 per cent. for the year on the ordinary shares. You will remember we increased the interim dividend so as to make the two distributions more equal; and after the payment of this balance dividend, and after carrying the amount I have mentioned to the reserve fund and £2000 to the pension fund, and providing for the Retiro works amortization account, our carry-forward is brought down to £51,937, which is £4557 less than last year. I think you will all agree that this is a very satisfactory result, looking at all the disadvantages we had to contend with—and especially the enormously high freights we have had to pay. When I return from Buenos Ayres, where I hope to make a thorough inspection of our business, I shall be better able to give you an opinion as to the immediate future of the Company; but as far as I can see at present, we need not be anxious. We have now probably seen the high-water mark of freights; and I have hopes that we may, in the immediate future, get our coal carried on more reasonable terms. The labour unrest in Buenos Ayres, especially that on the railways, has caused very considerable losses; but the services are now normal. What promised to be a record wheat and linseed crop has been spoilt by excessive rains; but the pastures have benefited very much by these rains, and an enormous maize crop is practically certain. So that I think the prosperous times which have been enjoyed by Argentina for some years are likely to continue. The City of Buenos Ayres is increasing in population very rapidly indeed, and I believe must continue do do so; and we have thought it advisable to apply for concessions to supply gas to the rapidly-growing suburbs of Vicente Lopez, San Isidro, San Fernando, Las Conchas, and San Martin. These applications are now before the authorities; and we have every hope of the concessions being granted on terms which will be mutually satisfactory to both the authorities and ourselves."

The CHAIRMAN said he thought they would agree that the notes threw a very clear light upon the position, and that the deficiency of profit was explained by the fact that they had spent some £23,000 extra on coal and the additional freight. Mr. Bowen had told them nearly everything that was going on; but he did not know that he had mentioned the fact that they were immediately putting into operation a large tar-plant for manufacturing products on a large and important scale, having bought the plant and the works from the old contractors. They would see with gratification the large extension of the system of arterial mains. There were 28 miles of additional mains, which was an extraordinary development, and 10,408 extra services—also a very extraordinary development. In addition to this, they had built the large gasholder which the Chairman had mentioned. He moved the adoption of the report and accounts.

Mr. J. C. IM THURN seconded the motion, which was carried unanimously.

It was then agreed, on the motion of the CHAIRMAN, seconded by Mr. IM THURN, that the balance of the profit and loss account—namely, £164,131—be divided as follows: In payment of a final dividend at the rate of 4s. 6d. per share, less income-tax, making a total distribution of 8 per cent. for the year on the ordinary shares of the Company, which will absorb £56,250; to place to reserve fund £18,944, which raises it to £90,000; to the pension fund a sum of £2000; and to the Retiro works amortization fund £35,000—leaving to be carried forward to the new account the balance of £51,937.

The retiring Directors (Mr. H. E. Jones, Mr. J. C. im Thurn, and Mr. C. J. Hegan) were then re-appointed, as were also the Auditors (Messrs. George A Touche and Co.).

The procedings concluded with votes of thanks to the staff, and to the Chairman and Directors.

SOUTHAMPTON GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held last Wednesday, in the lecture-hall of the new show-rooms, Above Bar, Southampton—the chair being taken by Mr. J. C. MOBERLY, M.A.

The CHAIRMAN, in moving the adoption of the report and accounts for the six months to Dec. 31, remarked that the Company were able to pay the maximum dividend of 5 per cent., and to carry forward a balance of £1018 to the reserve fund. This was due to legitimate business; and the gas sold for the half year was 16,000,000 cubic feet more than in the corresponding period of 1910, or 4·19 per cent., which was exceedingly satisfactory, as it was achieved in the face of very formidable competition. The Directors had done all in their power to bring this about, and had inaugurated a system by which a graduated scale of discount was allowed to merchants and traders, which would benefit them as well as increase the sale of gas. In order to meet the increased demand for gas in the Redbridge, Totton, and Eling area, a gasholder was being erected at Redbridge; and the Directors proposed to add to the plant by an extension of the retort-houses. During the recent coal strike, the Company had been able to maintain a full supply of gas to their customers, and they had also been able to do it without any increase in the price charged; and those who had gas fires or cookers must have experienced great benefit from this. From present appearances in the coal market, it seemed there would be an increase in the price of coal in the future; but they hoped it would not entail a corresponding increase in the price of gas. The Directors were glad to meet them in the new show-rooms, which had been an unqualified success. People could come there and see what was the best to have in the way of gas apparatus for heating, lighting, and cooking. It was proposed to give demonstrations in cookery from time to time in the lecture hall, which had been built for the purpose. The works were in a most satisfactory condition; and the new workshops, which had been completed, were excellent in every possible way.

Mr. A. W. OKE seconded the motion, which was carried unanimously; and the maximum dividend was thereafter declared. It was decided to give 100 guineas to the Mayor's Titanic Relief Fund.

The Directors, the Secretary (Mr. J. R. H. Jacobs), the Resident Engineer and Manager (Mr. Frank Durkin), and the staff were thanked for their services.

MANCHESTER AND CHEAPER GAS.

The Gas Committee of the Manchester Corporation have, on a reconsideration of their estimates, decided to inform the Finance Committee that they cannot make any further contribution to the relief of rates beyond the £50,000 already promised. Mr. W. Kay, the Chairman of the Gas Committee, has made it quite clear that, if the City Council compel them to give more than they have already agreed upon, the question of a reduction in the price of gas will inevitably have to be postponed. "We are anxious to make a reduction," said Mr. Kay, in the course of an interview. "The intention of the Committee is to get the price of gas to approach that of coal from the heating point of view. That is what we are aiming at. People have been driven more than ever before to the use of gas for heating purposes; this being due to the dearth and high price of coal, consequent upon the miners' strike. If we are to keep these new customers, we must have some reduction. It is a commercial scheme; and the way to retain what business we have got is to give the customer value for his money." Mr. Kay added that there was no doubt the high price of gas was standing in the way of the development of the gas undertaking; and it was a matter receiving earnest attention by the Gas Committee.

At the Council meeting last Wednesday, Mr. Fogarty, one of the Labour group, moved that the resolution of the Gas Committee to contribute £39,340 to the relief of rates and to reduce the cost of street lighting by £10,660 be referred back for further consideration. His object, he said, was to protest against the practice of granting large sums out of gas profits in relief of rates. The department should sell gas to all consumers at as near cost as possible. Alderman Smethurst pointed out that, as a Special Committee of the Council were now considering the question of what the trading Committees should contribute to the rates, it was premature to discuss the matter. It was also stated that, at the special meeting of the Council to be held on May 15 to consider the whole of the estimates for the current year, an opportunity would be afforded members to discuss the principle of allocating gas profits in aid of rates. By 45 votes to 29, the Council rejected Mr. Fogarty's motion to refer the minute back to the Gas Committee.

BIRMINGHAM GAS ACCOUNTS.

The accounts of the Birmingham Gas Department for the year to March 31 were adopted at a meeting of the Gas Committee on Monday of last week, and will be presented to the City Council at a special meeting on the 21st inst. It is stated that the contribution in aid of the rates will exceed the £75,621 handed over last year. The satisfactory character of the results achieved is emphasized by the fact that the charges for gas were reduced on two occasions during the year. In June, the charges to ordinary consumers for domestic purposes were reduced from 2s. 4d. to 2s. 2d. per 1000 cubic feet; while after the December reading of the meters, the price was further decreased from 2s. 2d. to 1s. 11d. For manufacturing purposes, the net amount of the two reductions was from 1s. 6d. to 1s. per 1000 cubic feet; and a proportionate concession was also made to those who use penny-in-the-slot meters. The consumption of gas, it is pointed out, is greater during the first quarter of the year than in any other; and the reduction in the charges during the quarter ended March 31 will represent something like £20,000 to the consumers in the city. Taking the year through, the average reduction will amount to about 5d. per 1000 cubic feet. The consumption of gas during the year, in round figures, was 8500 million cubic feet—an increase of about 5 per cent. over the previous year.

GAS PROFITS AND THE RATES AT ROCHDALE.

When the minutes of the Finance Committee of the Rochdale Corporation were brought forward for confirmation at a meeting of the Town Council last Thursday, a strong protest was made against the proposal to take from the profits of the Gas and Electricity Departments £1500 more than had been decided upon by the Gas and Electricity Committee. The Committee had offered £15,000 from the gas profits in relief of the rates—this being £3000 more than was given last year. But from the electricity works, which had a lessened profit on the year's working of £2799 as compared with the previous twelve months, only £2000 was voted in aid of the rates by the Committee, as against £5000 last year. The Finance Committee, however, insisted on a further sum of £1500 from the two departments.

At Thursday's meeting, Alderman J. E. Jones, the Chairman of the Finance Committee, in reply to a question, stated that £16,000 was being taken from the gas profits and £2500 from the electricity profits. Mr. Ogden, in protesting against the extra £1500 being extracted from the two departments, said it was weakening the power to produce profit, and would recoil on those responsible for it. They would have to pay more for coal, and the effect would be seen at the end of the current financial year. Mr. Blomley argued that the gas-works were making too much profit, and that gas should be supplied at a cheaper rate. In his opinion, it was unfair to relieve the rates in this way; for, if there was a surplus, it belonged to the people who produced it. Mr. Shawcross said it was with alarm he saw that, after taking profits for rate relief, only about £6000 was added to reserve. No private concern could carry on business on such lines. At the gas-works they were now paying off capital outlay for which 75 years was allowed; and plant still being paid for had been scrapped. Alderman Jones described the remarks of Mr. Shawcross as unfair. To say that nothing was put aside in the way of depreciation beyond £6000, was an untruth. A sum of £25,000 had been spent out of revenue on new retorts at the gas-works, and another £13,000 from the same source for water-gas plant. New apparatus put down out of revenue in the last four or five years, he added, would give as great a production as old machinery standing in the books at four or five times the amount.

The protests made were futile, and the minutes of the Finance Committee were confirmed.

THE PRICE OF GAS AT STOCKPORT.

Arguments For and Against a Reduction.

A proposal to reduce the price of gas 3d. per 1000 cubic feet gave rise to a long discussion at the monthly meeting of the Stockport Town Council last Wednesday.

The matter was raised by Mr. J. Welsh, who moved that a minute of the Gas Committee declining to grant such a reduction in price be referred back for further consideration. It was argued by Mr. Welsh and those supporting him that, instead of contributing £22,000 from gas-works profits to the relief of the rates, the Gas Committee should give the ordinary consumers the benefit of the profits by reducing the price of gas. It was pointed out that it was seven years since there had been a reduction to ordinary consumers, and that during this period the amount contributed out of the gas profits to the rates had risen from £7000 to £22,000. As a consequence, people who did not consume gas were receiving relief in rates from the gas profits to the extent of 1s. in the pound.

Alderman Charles Sharples, in the course of his remarks, said the Council ought to look upon this matter from a commercial standpoint, and ask themselves what was a reasonable profit for the Corporation to have from the gas undertaking. The outlay on the concern was approximately £444,000; and if they assumed that 5 per cent. was a reasonable profit, they would be entitled to take out £22,000. He would remind the Council that those who were fortunate enough to have shares in gas companies were receiving considerably more than 5 per cent. On certain gas shares he held he received 10 per cent. regularly. Therefore if a private undertaking was entitled to 10 per cent., surely 5 per cent was not an exorbitant sum for a corporation to expect from their gas undertaking. Considering the situation and the restricted opportunities they had of disposing of their residuals, he did not think 2s. 6d. per 1000 cubic feet, less discount, was an excessive price for gas. Practically 2s. 4d. was the net charge at the present time; and it compared very favourably indeed with other towns situated as Stockport was.

The Chairman of the Gas Committee (Alderman J. Fernley, J.P.) reminded the Council that if they took away the contribution from the Gas Department the rates would have to be advanced by 1s. 5d. or 1s. 6d. in the pound, which would mean a total of 9s. or 9s. 2d. This would be a serious matter to the town and its industries. In his opinion, it was imperative that the Corporation should have a source of income, and gas was one. A contribution of £22,000 in aid of the rates was a little over 4 per cent. on the capital; and this could not be considered unreasonable. Advocates of a reduction in price at the present juncture should remember that the Gas Committee had in the current year to face a greater expenditure than last year. The advances granted to the workmen meant an additional £3500 or £4000 per annum; and they estimated that the extra cost of coal would be anything from £5000 to £6000. A reduction of 3d. per 1000 cubic feet in the price of gas would amount to £7506; and this alone would mean an advance of 4d. in the rates. It would not, therefore, be wise to make any alteration in the price of gas at present.

Mr. M. M. M'Gregor said those who claimed that to reduce the price of gas would benefit the working people had not looked on both sides of the picture. The supposed benefit would, as a matter of fact, be a hardship. Supposing in a cottage house, rented at 4s. weekly, a man paid on the consumption of gas £2 per annum, which would mean 16,000 cubic feet, at the rate of 2s. 6d. per 1000 feet. If the gas was reduced 3d., the cottager would pay 4s. a year less for his gas. If the gas profits were depleted, as suggested, to the extent of even 1s. in the pound—not the 1s. 5d. mentioned by the Chairman of the Gas Committee—the landlord of the cottage would be called upon to pay 7s. a year more in rates, and would most certainly increase the rent, probably 3d. a week, which would be 13s. per annum. So, while the working man might save 4s. on the one hand, he would have to pay 13s. on the other.

On a vote being taken, 22 were in favour of the matter being referred back, and 33 against. The decision of the Gas Committee not to reduce the price of gas by 3d. was therefore confirmed. In committee, the resolution to reduce the price of gas to 2s. 3d., with discount, was defeated by eight votes to three.

NEW MILLS DISTRICT COUNCIL GAS UNDERTAKING.

Annual Report of the Manager.

At the Meeting of the New Mills Urban District Council on Wednesday last, the Gas Engineer and Manager (Mr. Philip Lancashire) presented his report for the year ended the 31st of March last. It showed that in this period 3191 tons of coal and 465 tons of cannel were carbonized; the coal gas manufactured being 43,094,700 cubic feet. The quantity of carburetted water gas made was 5,070,200 cubic feet; and 120 tons of coke were used, with 11,206 gallons of oil, in its production. The total quantity of gas made was 48,164,900 cubic feet—an increase of 2,727,400 cubic feet compared with the preceding year. The manufacture of sulphate of ammonia was again attended with marked success. Good prices were realized; and on the manufacture of 38 tons 4 cwt. there was a net profit of about £233. During the year the manufacture of carburetted water gas was introduced with success. While regretting the inconvenience caused to the consumers by bringing the plant into operation in the middle of December, there was no doubt that the Gas Committee acted wisely in adopting this process of gas manufacture as an auxiliary. The customers had been more than compensated for any inconvenience caused to them by being provided with an unrestricted supply of gas throughout the recent coal crisis—a condition of things which few towns up and down the country enjoyed, and which certainly could not have been given in New Mills but for the additional plant. The accounts showed that the gross profit made during the year was £1060. The councillors expressed gratification at the continued success of the works, and complimentary references were made to Mr. J. J. Hadfield, the Chairman of the Gas Committee, for his devoted interest in the undertaking, and to Mr. Lancashire for his untiring labours on its behalf. It was decided to hand over £500 of the profits for the reduction of the district rate.

BIRMINGHAM GAS-FITTERS.

The Agreement with the Corporation.

It will be seen from the following circular-letter issued by Mr. G. H. Tyler, the Secretary of the Birmingham Master Gas-Fitters' Association, that the agreement come to with the Corporation, on lines set out by him, is regarded as being very satisfactory. Mr. Tyler says:

"A considerable amount of interest has been aroused throughout the country in respect to the agreement that has recently been entered into between the City of Birmingham Gas Department and the Association, whereby it is provided that certain of our members shall be appointed 'authorized gas-fitters to the Gas Department,' and a scale of charges is endorsed on the agreement, which is subject to revision from time to time, as may be agreed upon, between the department and the Association. Further, arrangements regarding the supply of the necessary materials in respect of maintenance and a uniform standard quality of mantles, together with a joint contract to purchase approved mantles, have been mutually arranged. This agreement is the outcome of many years' active negotiations with the Gas Department. It is unquestionably of the greatest value to the gas-fitting industry in this community, and is, I believe, the first of its nature in the country entered into between a corporation and an association of master gas-fitters. The Association was formed seven years ago, for the purpose of protecting the interests of master gas-fitters in Birmingham and district in all matters affecting their business interests, and any matters affecting their united interests, and particularly in respect of their position with regard to municipal trading as carried on by the Gas Department, and to limit their trading. It has been fully appreciated that the primary object of the Gas Department is the sale of gas; and by supplying the same at a reasonable price, and of a good quality, it assisted the trade to a great extent in the competition with the electric light. Rightly or wrongly, the Gas Department, in seeking to increase the sale of gas, have undertaken, not only the supplying of gas-cookers, lamps, gas-fires, &c., on the permanent hire system, but, in addition, have done a large private household and factory trade in the sale of fittings from their costly and elaborate show-rooms, the maintenance and supply of lamps, burners, &c., which the private master gas-fitter properly regarded as depriving him of his legitimate trade, and against which, with his limited resources, he could not hope to compete. We view the future with every confidence. The agreement has been entered into in a spirit of conciliation, and will be interpreted in a loyal and proper manner. The official recognition establishes the trade of gas-fitters as a distinct industry. We have reserved to us as an Association the authority for further negotiations with the Gas Department, as and when desired, in an effective capacity; and we hope, and believe, that our success will be the means of strengthening the interests and bargaining powers of master gas-fitters in other parts of the country in their dealings with what may be termed trading departments of corporations." It is thought that a "national association might be well within the bounds of practical politics."

That the journeymen gas-fitters are also active was shown by a meeting held last Saturday week. Councillor A. R. Jephcott presided, and said he was glad the Birmingham Corporation had met their employees in a fairly generous spirit. Possibly the workmen had not got so much as they thought they were entitled to; but he believed the employees recognized that the Committees had gone carefully into the whole question, and tried to act honourably and equitably. The Corporation's action, however, should not only put money into their own employees' pockets. It should be an example to private employers to bring their rates up to the Corporation standard. The majority of men in the gas-fitting trade were employed by the Corporation; but the Gas Department had recently entered into an arrangement whereby more work would be given out to the master gas-fitters of the city. The workmen must see to it that these private employers gave their men the same conditions of labour as they enjoyed under the Corporation. He was not one to preach trouble. He did think, however, they ought to proceed with an application, not only to the Corporation, but also to the master fitters of Birmingham, for increased rates of pay. Mr. Kesterton remarked that Birmingham gas-fitters had not received any advance in wages for ten years. They seemed to be deplorably behind the times. Councillor Lovsey said he was confident the members of the Gas Committee would give sympathetic consideration to any reasonable demand they might make. The gas-fitters, however, could never hope to achieve complete success in any agitation they undertook until they had strengthened their organization. The question always put by the employer, whether a corporation department or a private trader, to a union making application on behalf of the workmen was, "How large a proportion of the employees do you represent?" If the answer was "All" or "Nearly all," their chances of a favourable reply were much greater. Mr. S. B. Watts moved the following resolution, which was carried unanimously: "That an application of journeymen gas-fitters of the city and district be made to the master gas-fitters and the Gas Committee of the City of Birmingham for an increase of pay of 1d. per hour."

New Gas-Works for Alfreton.—The Directors of the Alfreton Gas Company have, it is stated, adopted a scheme for the erection of new gas-works near the Midland Railway station. This step has become necessary owing to the fact that much of the present plant is obsolete and inadequate; and the distance from the railway makes the cost of carting coal a heavy item of expenditure. The new plant will be of the latest type, with apparatus for the manufacture of sulphate of ammonia. The existing works will be abandoned, though the offices and show-room will be maintained on their present site.

GLASGOW SMOKE ABATEMENT EXHIBITION.

Progress of the Arrangements.

Reference has already been made to the decision come to by the Glasgow Corporation to hold a second smoke abatement exhibition in the "Zoo" Buildings from Sept. 20 to Oct. 12 next. It will comprise appliances for lighting, heating, cooking, power, and manufacturing without smoke, and be under a Committee consisting of the Lord Provost and members of the Corporation, with Bailie Paxton as Convener. Mr. Alexander Wilson, M.Inst.C.E., the General Manager of the Gas Department of the Corporation, will have the supervision of the Gas Section; Mr. W. W. Lackie, M.Inst.C.E., the General Manager of the Electricity Department, will have charge of the Electricity Section; Mr. S. B. Langlands, the Corporation Inspector of Lighting, of the Lighting Section; and Mr. Peter Fyfe, the Corporation Sanitary Inspector, of the Smokeless Fuel Section. We learn from the General Manager (Mr. James M. Freer) that rapid progress is being made in the organizing of the exhibition. He states that nearly three-fourths of the available space has been taken; and it is anticipated that before the end of the present month the whole of the space will have been booked. The Corporation intend to make a special appeal to manufacturers to instal in their works appliances for the abolition of smoke; and already a number of the exhibits are fixed for the exhibition of smokeless fuels, patent appliances for boilers, gas-heated furnaces, &c. They also intend to invite representatives of all gas and electrical public bodies throughout Great Britain to visit the exhibition; and, judging from the response which was made to the invitation issued for the last exhibition, the list of deputations for the one now in progress will far exceed that of its predecessor in 1910.

A special feature of the exhibition will be the combined exhibit of the Corporation and the Electrical Allied Trades Manufacturers' Association, which will take the form of an electrical lunch and tea room, including kitchen. All the latest electrical appliances will be shown in actual working operation; and no effort will be spared to make the exhibit not only interesting but educational.

A Special Sub-Committee has been arranged by the Glasgow School Board to act in conjunction with the Smoke Abatement Committee for the organization of competitions for young ladies, full particulars of which will be given at a later date. A special lecture hall is being erected inside the exhibition building for lectures and demonstrations; and demonstrators have been engaged specially for the purpose. It is the intention of the Committee that either a lecture or a demonstration shall be a continuous feature of the exhibition and be given from 11 a.m. to 10 p.m.

At a sale conducted by Mr. J. Southwick last Tuesday, a few "B" £5 preference shares in the Bilston Gas Company were sold at £9 each.

COKE AND GAS MANUFACTURE IN BELGIUM.

According to an article which recently appeared in "The Times," the growing demand for metallurgical coke in Belgium has brought about considerable improvements in connection with the installation of new coke-oven plants, in which the Province of Hainault is taking the largest share. In place of the old plant, comprising 360 ovens without recovery of bye-products, the Société Charbonnière de Strépy-Bracquegnies in the Centre district have recently started operations with new works, including an installation of two batteries of 50 units each. These will be capable of a daily output of 750 tons, and will be fitted with plant for the recovery of bye-products, the output of which is estimated at about 10,260 kilos of tar and 4560 kilos of sulphate of ammonia daily. Other installations at present in progress include one of 32 units by the Société Anonyme des Fours à Coke at Quiévrain, two batteries of 36 ovens by the Charbonnages Belges at Frameries, and a plant with 25 units by the Société Anonyme des Fours à Coke at the same place. The Charbonnages du Nord de Genly (near Charleroi) have begun the erection of 30 coke-ovens of the Solvay type; the Sambre et Moselle Company are contemplating the installation at Montignies-sur-Sambre of a battery of 70 units, and the Thy-le-Château et Marcinelle Company have decided upon the construction of a new group of 46 units. On the completion of the installations which have been decided upon, it is expected that the output of the Hainault Province, which for the year 1910 amounted to 2,075,000 tons of coke (75 per cent. of the total), turned out by 2116 ovens occupying 2600 workmen, will be increased by 1500 to 2000 tons a day.

With the object of obtaining a portion of their supply of gas from coke-ovens, the Société de Gaz de Mons have entered into an agreement with the Charbonnages de Bray in the Centre district. The gas is to be supplied to the holders at Mons by a pipe-line running from Bray, about 4¾ miles distant, through Villers-St.-Ghilain and St.-Symphorien. The service will extend to the communes of Nimy, Obourg, and Ghlin, near Mons; and it is expected that the works will be completed at the beginning of next year. From Mons the pipe-line is to be prolonged to Wasmuel, about 6 miles distant, to supply the Société d'Eclairage par le Gaz du Bassin Houllier de Mons, by which a number of communes in the Borinage district are served.

The coke-oven plant which is being erected near Zandvoorde includes a double battery of 40 units each, the gas from which is to be supplied to Ostend and sixteen neighbouring communes. The first battery, which it is expected will be put in operation at the beginning of next year, is calculated to produce 60,000 tons of coke during the first year, requiring 87,600 tons of coal to be imported from England.

Messrs. Ed. Bennis and Co., Limited, of Little Hulton, Bolton, have lately obtained a contract for the supply of mechanical stokers and self-contained compressed-air furnaces for burning coke breeze for the Windsor Street Gas-Works of the Birmingham Corporation.

The BEST Circulator with the BEST Thermostat.

Reliable, moderate in price, economical in use, easily installed and always ready.

This describes **our** Cast-Iron "GULF STREAM" Circulator.

A convincing point about our "GULF STREAM" is the economy effected by this Thermostat or Heat Control—which is such an

Important Part of a Hot Water Circulator.

Its maintenance is practically nil: no leathers or rubbers to perish: no liquids to evaporate: cannot get out of order: always reliable and effective, and every heater has our full guarantee.

The Richmond Gas Stove & Meter Co., Ltd.,

WATER HEATER SPECIALISTS,

WARRINGTON AND LONDON.

ALKALI MANUFACTURERS' OPPOSITION TO GAS BILLS.

The action of the United Alkali Manufacturers' Association in opposing the residuals clauses in certain Gas Bills of the present session is being criticized in other publications than those immediately connected with the gas industry. In the current number of the "Rural World," a journal for the landed and agricultural interests, the following remarks appear under the heading of "Agriculturists and Free Trade."

We have, with others, more than once called attention to the anomalous position of Sir Alfred Mond, who, as the Treasurer of the Free Trade Union, preaches Free Trade from political platforms, but adopts Protectionist principles in his business as a chemical manufacturer. We call attention now to a further aspect of this attitude of Free Traders. During the past month, several Bills have been brought before the House of Commons to enable different gas companies to extend their operations. Considerable opposition, however, has been experienced, and some of it has been of a particularly vicious kind. For example, there is a very powerful Association known as the United Alkali Manufacturers' Association—in which, we understand, Sir Alfred Mond is a shareholder—who have opposed the different Bills alluded to; and they have done so on the ground that, if the Bills were passed, the gas companies would be enabled not only to buy or manufacture all the chemicals they wanted for the purpose of working up their own residual products, but even to buy residual products from other concerns, and to work up and to resell them. The gas companies—some of the best-managed concerns in the kingdom, and the most considerate to their workmen—have enough trouble to contend with already in refuting, among other things, the untrue and often wild assertions of companies interested in the sale of electricity for lighting and power purposes; but it is hard lines that people should seek to prevent them from working up any residual products they can get hold of, so much of which products have (we may add) an agricultural value, and value also in many other directions. Sulphate of ammonia, for instance, is a bye-product of gas manufacture, and is a most valuable one to the agricultural industry as a fertilizer. Our Free Traders, however, in opposing the free production and free exchange of goods (we use the term "free" in its economic sense), care as little for agriculture as they do for any other industry but their own. They are, in fact, Protectionists of the worst type—of a type which no Tariff Reformer, we venture to say, would tolerate for a moment.

The Freshwater (Isle of Wight) Gas Company are raising additional capital to the amount of £3195 for the purpose of meeting the increased demand for gas in the district, for putting up a gasholder, providing new sulphate of ammonia plant, and other requisites.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At the meeting of the Edinburgh and Leith Corporations' Gas Commissioners held last Monday, Provost Malcolm Smith, who presided, in reply to Judge Douglas, said that the correspondence which had taken place with the tradesmen of the city—plumbers and gas-fitters and others—anent the fitting of gas appliances, was still under consideration. Judge Inches, the Convener of the Works Committee, reported that the Committee had agreed to the recommendation of a Sub-Committee on the application of the pipe-department employees for a rise of wages. The recommendation of which the Committee approved was that a rise of ½d. per hour be given to every employee (not restricted to the main and service-pipe department) at Granton and elsewhere at present earning 6d. an hour or under; further, that the wages of the brass-finishers be raised to 7½d. an hour. By this means, 270 men will share in an increase totalling £1500 per annum. The Commissioners adopted a report of the Works Committee which stated that, having considered as to the price to be charged for gas for public lighting (not including common stairs) in Edinburgh and Leith (for the year from Whitsunday next as to Edinburgh, and from May 1 next as to Leith), they resolved to recommend that the price should be continued at 2s. 3d. net per 1000 cubic feet for incandescent lighting, and 2s. 7d. net for flat-flame lighting; the rate for Leith common stair flat-flame lighting to be 2s. 7d. net per 1000 cubic feet during the year from Sept. 1 next.

At the meeting of the Edinburgh and Leith Corporations' Gas Commissioners on Monday, the report for March showed that at Granton Gas-Works 171,572,000 cubic feet of gas were produced—a decrease of 8·85 per cent. as compared with the corresponding month of last year. This is accounted for by the coal strike and the spell of comparatively warm weather experienced during the month.

A series of demonstrations on cooking by gas-stoves was given at Aberdeen last week in the hall of the Young Men's Christian Institute, under the auspices of the Gas Department of the Aberdeen Corporation. All the gas appliances were supplied by the department. The demonstrator was Miss Ferguson.

There is every prospect that Dundee, as the result of the coal strike, will not have to pay more for its gas. It is expected that the strike will result in an increase in the price of coal; and on the consumption at the gas-works for a year, at an increase of 1s. per ton, the extra charge would be £4000. It is understood, however, that Mr. Yuill, the Engineer, will be able to continue to supply gas at the existing figure—2s. 2d. per 1000 cubic feet—during the ensuing year.

The final meeting of the Port Gordon Lighting Committee was held on Tuesday. It was agreed to recommend to the Banff District Committee the adoption of the "Tures" (petrol) system of lighting. It is computed that about ten to twelve lamps will be sufficient to light the whole village, and that the total cost will approximate about £120.

"SUN" and "CALEFACTOR"

Several people have asked us if the "Calefactor" is meant to supersede our famous "Sun" Boiler. The answer is, "Not in the least." The "Sun" never sold so well as to-day. Wherever the "Sun" can be used, it will always be by far the cheapest and best as against every other possible type. Any apparatus with separate tank must inevitably use more gas to maintain temperature than the "Sun," which, having boiler and tank in one, saves the loss in circulation between these. But there are many cases where, from various causes, an apparatus with separate tank is found desirable. In the "Calefactor," the hitherto persistent drawbacks to such an apparatus are overcome. Hence—Use the "Sun" if you can; If you can't, Use the "Calefactor."

Essex Works, Birmingham. JOHN WRIGHT & Co.

34.

Before the new system of lighting was entered upon, the Buckie Gas Company were approached; but they would not give any promise of taking gas to Port Gordon at an early date.

A report has been issued to the members of the Edinburgh and District Water Trust, to the effect that sand filters are cheaper in the end than mechanical filters. It is pointed out that the sand filters at Alnwick Hill have been working for thirty years, and are now as good as ever.

All the petitions against the Provisional Order in connection with the Dunbar water scheme have now been withdrawn, and the Order will proceed through the usual course. The scheme has been promoted for the purpose of augmenting the present supply of water, and is expected to entail an outlay of £16,000. It is anticipated that two years will be required to complete the works.

At a special meeting of the Perth Town Council on Monday, the position with regard to the Loch Ericht Water and Electric Power Bill was considered; and it was resolved to continue opposition to the measure unless certain clauses were inserted embodying, among other matters, the making of reasonable arrangements for obtaining water for domestic purposes from Loch Ericht at any future time.

The decision has now been given in the arbitration between the Anstruther Easter Sea Box Society and the Town Council of St. Andrews regarding the price to be paid for the land on which the new reservoir at Cameron for St. Andrews is constructed. The Sea Box Society claimed £12,000 for 103·65 acres and the Town Council lodged a tender of £5200. The Arbiters could not agree; and the matter was remitted to the Oversman—Mr. A. H. B. Constable. The award is now made for £5178 5s. 6d., being £21 14s. 6d. below the tender, with interest as arranged between the parties.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 4.

Sulphate of Ammonia.

The lack of strength in the position of this material has become much more apparent this week, and it has only been found possible to dispose of the current production at gradually declining prices. Many consumers have now adopted a waiting policy, in the hope of doing better later on; while dealers are evidently in no hurry to cover their commitments for May shipment. The closing quotations are £14 15s. per ton f.o.b. Hull, £14 16s. 3d. per ton f.o.b. Liverpool, and £14 16s. 3d. per ton f.o.b. Leith. In the forward position, few new transactions have transpired, but producers continue to ask £14 10s. per ton f.o.b. at the principal ports for July-December delivery, in equal monthly quantities, although it is reported that there are second-hand sellers at less money.

Nitrate of Soda.

The situation of this article is hardly so firm, and quotations have been reduced to 11s. per cwt. for 95 per cent. quality, and to 11s. 11½d. for 96 per cent. quality, on spot.

LONDON, *May* 6.

Tar Products.

The markets for tar products keep firm. In pitch, the inquiry is continuous, and further business has been done during the past week at slightly improved prices. Benzols are steady, though there is little new business for either grade. Solvent and heavy naphthas are in good demand, and prices remain firm. In carbolic, there is not much inquiry; but consumers are not very firm in their ideas of value. Creosote is steady; and a fair number of transactions are reported at the equivalent of to-day's quotations.

The average values during the week were: Tar, 28s. to 32s. *ex* works. Pitch, London, 53s. to 54s. 6d.; east coast, 52s. 6d. to 54s.; west coast, Clyde 53s. 6d. to 54s. 6d., Manchester 51s. 6d. to 53s. 6d., Liverpool, 52s. 6d. to 53s. 6d. Benzol, 90 per cent., naked, London, 11d. to 11½d.; North, 10¾d. to 11d.; 50-90 per cent., naked, London, 10d.; North, 9½d. Toluol, naked, London, 10d. to 10½d.; North, 9½d. to 10d. Crude naphtha, in bulk, London, 4½d. to 5d.; North, 3¾d. to 4½d. Solvent naphtha, naked, London, 1s. 0½d. to 1s. 1d. f.o.b.; North, 11d. to 11½d. f.o.b. Heavy naphtha, naked, London, 11d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 2⅞d. to 3¼d.; North, salty 2½d. to 2⅝d.; liquid, 2⅝d. to 2¾d. Heavy oils, in bulk, 3¼d. to 3⅜d. Carbolic acid, casks included, 60 per cent., east and west coast, 2s. 4d. to 2s. 5d. Naphthalene, £4 10s. to £8 10s.; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The demand has not been so great during the past week; but on the whole prices remain about the same. Actual Beckton is quoted £14 5s. Outside London makes are £13 17s. 6d. to £14; Liverpool, £14 18s. 9d.; Hull, £14 17s. 6d.; Leith, £14 18s. 9d.; Middlesbrough, £14 17s. 6d.

Gas-Meter Testing at Coventry.—The annual report of the Inspector of Gas-Meters at Coventry shows that the number of meters tested during the past year was 7897, compared with 5806 in the previous year. According to the financial statement, there was at the end of the year a balance of income over expenditure of £155; the fees for testing meters amounting to £214.

Ripon Gas-Works Finances.—The Gas Committee, at the quarterly meeting of the Ripon City Council, reported a balance in hand of £39 at the end of the financial year, as compared with a deficit of £1694 at the same time last year. On account of the reduction of lighting in consequence of the coal strike, the Committee reduced the charge for public lamps for the half year by £60. It was stated that the coal strike had cost the Gas Department £284.

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CLEETHORPES GAS-WORKS	..	Oil or Benzol Carburetting.	
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NEWTON ABBOT	,,	..	Oil ,,
NEW MILLS	,,	..	,,
PRESCOT	,,	..	Tar ,,
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BARKING	,,	..	,, ,,

Plants made from 50,000 cubic feet per day upwards and to suit local conditions.

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COAL TRADE REPORTS.

Northern Coal Trade.

There is now a much heavier output of coal; and thus the price has fallen for some classes. The steam coal trade shows reduced values, though the exports are heavier. For best Northumbrian steams, about 15s. per ton f.o.b. is quoted; second-class steams, 14s. 6d.; and steam smalls are firm at about 10s. to 10s. 6d. Where there is the need for early shipment, the prices are in some cases rather higher. The gas coal trade has shown a little ease; but the demand seems to be relatively better than for steams. Best Durham gas coals may be quoted at 15s. 6d. per ton f.o.b.; and for second-class about 15s. For "Wear specials," the f.o.b. price is possibly 18s. per ton. A contract for good Durham gas coal has been fixed for Randers (Denmark), at a price of about 16s. 3d. per ton f.o.b., for this month's delivery. There are other contracts pending; but the lower tendency of prices keeps back some buyers, though a recovery of prices is by a few expected. The coke trade is brisk. The retail demand for gas coke has fallen off now that coal is lower in price. Good gas coke for export is steady in price, and from £1 to 21s. per ton f.o.b. in the Tyne or Wear is quoted.

Scotch Coal Trade.

Throughout the Scotch coal trade, prices are now approximating their normal level. Last Friday, the quotations f.o.b. Glasgow were: Steam coal, 14s. to 14s. 6d.; splint, 14s. to 15s.; ell, 13s. 6d. to 14s.; trebles, 13s. 6d.; doubles, 13s.; and singles, 12s. In Fife, the export market is strong; and on Friday best screened navigation coal was at Methil 18s. 6d. per ton f.o b. At Leith, dross was 8s. 6d. to 9s.

Gas Explosion in Birmingham.—As the result of a gas explosion, a workman in a Birmingham factory was somewhat severely burnt last Friday. He was attending to a gas enamelling-oven when the explosion occurred, which blew off the door of the oven and caused extensive damage to the shop.

Profit on the New Mills Gas Undertaking.—Members of the New Mills Urban District Council had before them at last Wednesday's meeting the annual report of Mr. P. Lancashire, the Gas Manager, and also the balance-sheet of the undertaking. The gross profits were £2326. Interest on loans and sinking fund absorbed £1695, leaving £631. Extensions and improvements cost £170, so that the disposable balance was £461. With the sum brought forward from last year, the amount in hand was £1060. It was resolved that £500 be handed over in relief of the rates; and Mr. Evans, who seconded the proposal, said it was well known that, were it not for this £500 grant from the Gas Department, the rates would total 3s. 1½d. or 3s. 2d., instead of 2s. 9d. in the pound. Mr. J. T. Wharmby said the Council had every reason to be proud of their gas-works. He expressed his appreciation of the way the Gas Manager and the Chairman of the Gas Committee had discharged their duties in the interests of the ratepayers.

Claim for Damage to Crops by Noxious Gases.

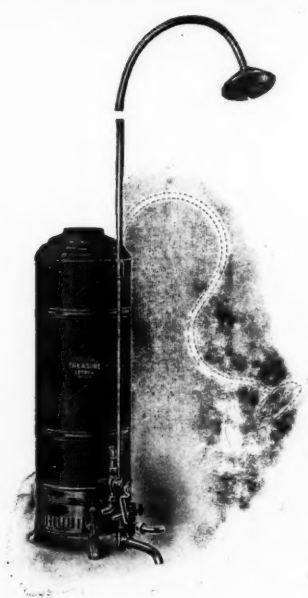
Sheriff-Principal Lees, at Falkirk, gave judgment last Tuesday in an appeal from a decision by Sheriff Moffat in an action brought by Mr. Robert Smith, a farmer, of Middlefield, Falkirk, against the Corporation of that town. Mr. Smith claimed £45 damages on the ground that he had suffered loss and damage to his crops during the year 1910 through noxious fumes and gases being continually allowed to escape from the gas-works. Sheriff Moffat decided in favour of the Corporation, with expenses; and this decision was upheld by the Sheriff-Principal—modified expenses being granted.

Gaseous Fuel and Smoke Abatement.

We have received a copy of the "Christian Science Monitor," of Boston (Mass.), for the 17th ult., which contains a special article on the recent Smoke Abatement Exhibition at the Royal Agricultural Hall, Islington. In the course of it the writer said: "A visit to the exhibition gave one the impression that the remedy for the smoke trouble lies in refraining from the use of coal in its crude state, not only for domestic heating, but for nearly all other purposes. Coal is a most important source of power, and Sir Boverton Redwood, a leading authority on petroleum, has stated that if the whole of the crude petroleum produced in 1910 had been employed as fuel for steam raising, it would not have replaced much more than 5 per cent. of the world's output of coal, while if used in internal combustion engines, it would have been equivalent as a source of power to about 15 per cent. of the coal. . . . It would appear, therefore, that while we shall continue to employ coal for some time to come, it will probably be utilized in a more scientific manner by converting it into gas, coke, and tar; using both the former separately for the production of heating, since they are easily burnt without the production of smoke, and employing gas in the internal combustion engine to produce power. The use of gas for cooking has made considerable progress in recent years; but there is still a strong prejudice in many quarters against its employment for domestic heating. This prejudice is due largely to the type of gas-fire supplied by the makers, who, realizing that gas is a comparatively expensive fuel, sought to utilize as much as possible of the heat produced, and therefore arranged matters so that the air in the room was warmed by contact with hot surfaces. In a rather damp climate, such as is general in Great Britain, an air temperature much above 62° Fahr. is not agreeable, though the air may be reasonably pure. The more satisfactory method would undoubtedly be a fire which warms mainly by radiation, like the open coal-grate. Once the makers of gas apparatus endeavour to adopt this principle, the existing prejudice will be removed."

Price of Gas at Burton.—The Burton-on-Trent Gas Committee have decided to recommend a reduction in the price of gas from 2s. 4d. to 2s. 2d. per 1000 cubic feet.

PARKINSON
WATER HEATERS.



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Hot or Warm Showers at any Temperature desired.

The Bottom Outlet is on a Swivel Joint, and when turned to one side the water passes into the shower.

See Water Heater Catalogue No. 100 for Full Particulars of the above and other appliances.

THE PARKINSON STOVE COMPANY, Ltd.
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Tarred Roads and Fish Destruction.

Under the heading of "Fish Killed by Tarred Road Drainage," the following appeared in the "Daily Mail" yesterday: "Mr. R. B. Marston, Editor of the 'Fishing Gazette,' informs us that on Saturday he received the following telegram from Mr. F. Napier Sutton, President of the Friendly Anglers' Society, whose fishery is in the Colne, Hertfordshire: 'Every fish between Watford and Rickmansworth killed to-day. Friendly Anglers' Fishery destroyed.' Thousands of fine trout and other fish in five miles of water have therefore, says Mr. Marston, been killed; the destruction, it is supposed, being caused by storm water from roads dressed with raw unpurified tar. Surface washings, where properly purified tar is used, are stated to have no effect on the fish nor on the water flies and insects on which they live. The Watford destruction, the latest and most serious of several imputed to the same cause, is the more unfortunate as the river, from an angler's point of view, was just recovering from a wholesale destruction of fish by poisoning three years ago. It was due to Mr. Sutton's exertions that anglers were looking forward to this season providing a revival of the prosperity of the Friendly Anglers' Society, which is one of the oldest angling clubs in England, and its water was famous among anglers." We are informed that there is no justification for the conclusion arrived at by Mr. Marston; but that nothing definite can be stated until after an official inquiry has been made into the matter.

Increased Gas Profits at Blackpool.

At the meeting of the Gas Committee of the Blackpool Corporation on Monday last week, Mr. John Chew, the Gas Engineer and Manager, presented a very satisfactory report on the working of the gas undertaking in the past financial year. The output of gas was 588¾ million cubic feet; the increase in the twelve months being 20 millions. Of this quantity, 98·34 per cent. was accounted for; condensation and main losses absorbing 1·66 per cent. only. The consumers now total 15 840 —an increase of 665. The financial side of the Gas Department during the period under review was affected more or less by the hot summer, the railway strike, and the coal strike, each of which entailed much extra work on the staff. The works have a gross capital of £215,000, less a sinking fund of £85,000—£130,000. The income last year was £95,000, and the working expenses were £69,000; leaving a gross profit of £26,000. Loan and sinking fund charges absorbed £11,300; and the net profit was £14,700, against £14,000 the previous year. The estimated profits were £12,700. By adding this profit to that of previous years, it is found that the gas-works have yielded the town no less than £308,000, besides £85,000 in hand for redemption of loans.

Wasteful Use of Water.—The excessive consumption of water is at times a matter of some concern though its supply under ordinary conditions is in excess of the demand. A consumer named William Fry was prosecuted recently for allowing water to run to waste, when it was stated that the consumption amounted to about 50 gallons per head per day, and that the waste of which this large quantity is a symptom is difficult to detect. In Fry's case, water was found at midnight running from a tap fully open into a pan containing salt fish—the assumption being that it was intended so to run until the morning, and the waste being at the rate of 250 gallons per hour. The Magistrates imposed a small fine.

Wigan and the Coal Strike.—When moving the confirmation by the Wigan Town Council of the minutes of the Gas Committee, Mr. Seddon referred to a report which dealt with the purchase of coal and the sale of coke during the strike, and presented a statement of coal purchased at other than contract prices through the strike and coke sold at enhanced prices. He showed that the increased cost of 659 tons of coal so bought was £262; but the increased revenue from 1668 tons of coke sold during the strike was £387. Thus there was a balance to the credit of the Committee of £125. This satisfactory outcome was due to the exertions of the Engineer (Mr J. Timmins) and the Assistant-Manager. Credit was also due to the Emergency Sub-Committee.

Public Lighting at Brighouse.—The Brighouse Town Council have decided to transfer the street lighting from the Highways Committee to the Gas Committee. In submitting the resolution, Alderman K. Brown stated that for many years the Gas Committee supplied the gas for street-lamps without making any direct charge; but seven years ago the responsibility was placed on the Highways Committee. This method had involved a dual form of management, which had not worked altogether satisfactorily. Now it was proposed that a Special Lighting Committee should be formed, on which the Chairman of the Highways Department would have a seat; and the lighting would be treated on a business footing, just like any other department of the Corporation work. In the first year that the Highways Committee took over the work, the cost of the gas supplied was £2953; whereas last year, notwithstanding additional lamps, the cost was only £1240—a saving of £1713.

Gas-Mains Extension at Darwen.—The application of the Darwen Corporation for sanction to borrow £3600 for an extension of gas-mains has been granted by the Local Government Board. It will be remembered that at the Local Government Board inquiry held at Darwen in the early part of February last as to the application, opposition was offered to the granting of the required power unless it was coupled with a condition that no more gas profits were given in aid of rates or other purposes. This opposition was led by Mr. T. Duxbury, a member of the Town Council and formerly Manager of the gas undertaking, who contended that the gas, electricity, water, and tramways undertakings should, after providing a sufficiently substantial reserve fund, be worked at cost price, seeing that the customers not only paid the cost but all the capital charges, including interest and a sufficient amount extra to redeem the capital, while the ratepayers, as such, did not pay one penny. Another point raised at the time by Mr. Duxbury was whether the Local Government Board had power to grant the loan; his opinion being that, as the Darwen Corporation had exhausted their borrowing powers for gas-works purposes, they should have gone to Parliament.

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The "Bachelor"

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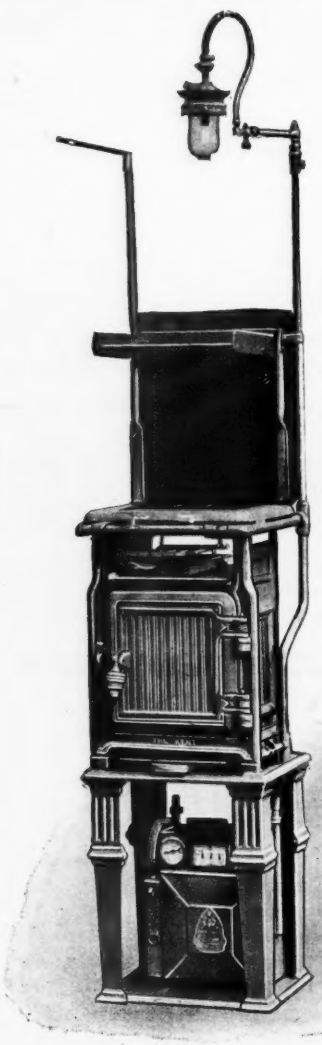
COOKER ON STAND,
PLATE RACK & ENAMELLED BACKPLATE,
TOWEL RAIL,
INVERTED INCANDESCENT BURNER.

Specially designed for Workmen's Dwellings, Flats, Bungalows, and Houses for more than one Tenant.

COMPACT and COMPREHENSIVE.

Economizes Space, Piping, and Labour in Fitting.



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SHOW-ROOMS AND BRANCHES: 25, Princes St., Oxford Circus, W.; 136, Renfield St., GLASGOW; 56, Broad St., BIRMINGHAM; 83, Old Market St., BRISTOL; 13, Whitworth St. West, MANCHESTER; 8, Exchange Place, Donegall St, BELFAST; 333, Queen St., MELBOURNE; and 12, Cunningham Lane, Pitt St., SYDNEY, N.S.W.

Damage to Street-Lamps.—Considerable damage having been done to street-lamps in the Camborne district, the District Council wrote to the Local Government Board to inquire whether it had power to offer a reward for information leading to the detection of offenders. The Board, in reply, stated that they thought any legitimate expense which would ensure the efficiency of the public lighting service performed by the Council might be defrayed by them. The Board would regard it as within the competency of the Council to contract by advertisement to pay for such information.

The Bury Gas Undertaking's Successful Year.—At Thursday's meeting of the Bury Town Council, Mr. S. Kay, the Chairman of the Gas Committee, announced that he had just got the draft balance-sheet of the year's working of the department. This showed a profit of £8733, compared with £7710 for the previous financial year, or an increase of £1023. He thought that not only the Committee but the Council would be gratified at the result of the year's working of the gas undertaking. If the usual practice is followed, the profit will be divided into two moieties—one of which will go to the relief of the general rate, and the other to a reduction in the price of gas.

Ventilation of Gas-Cookers.—It was stated at last week's meeting of the Salisbury Town Council that the Medical Officer of Health (Dr. E. T. Fison) had reported to the Sanitary Committee that the majority of gas-cookers in the district had no means provided for proper ventilation. He expressed the opinion that the vent at the back of the oven should be connected by a flue to the chimney, and that a hood should be fitted over the grid on the top of the stove and also connected by a flue with the outer air. In the course of some discussion, Alderman Folliott said it seemed to him that this was "another piece of that grandmotherly legislation which they were gradually getting accustomed to." Dr. Fison having remarked that Mr. Norton H. Humphrys (the Company's Engineer) had promised to make experiments in connection with the ventilation of gas-stoves, it was resolved to approach the Company in a friendly spirit, and ask them to endeavour to remedy the matter.

Improved Church Lighting at Shanklin.—The lighting of St. Paul's Church, Shanklin, has lately been greatly improved by the removal of the old upright gas standards, and the substitution of groups of three 75-candle lamps attached to the stone columns in the aisles. There are 31 lamps, placed 11 ft. 6 in. above the ground; and they are lighted by pneumatic switches. During the portions of the service where but little light is required, the majority of the lamps can be switched off. The burners are the "Nico" type; and the church can be illuminated with the full power of the lamps for 4½d. per hour. The wrought-iron arms and scroll work for the lamps were made at the works of the Shanklin Gas Company, whose Engineer and Secretary (Mr. Frank C. Taylor) carried out the installation, which is believed to be the first of the kind in the Isle of Wight. Though it cost upwards of £60, the lighting of the church will in future be very economical.

Gas Supply at Retford during the Coal Strike.—At last Friday's meeting of the Retford Town Council, Mr. Denman congratulated the Gas Committee and the Manager (Mr. J. B. Fenwick) on the arrangements made at the works during the recent coal strike. In addition to an unrestricted supply of gas, they managed to do admirable work in supplying fuel to public institutions, while there had been plenty of coke for the poor without any increase in price. Mr. Williamson remarked that, although a tremendous strain was put upon the Committee, they found themselves able to cope with the difficulty. As to the Manager, he was perfectly cool throughout, and one never met with more courtesy from him. In the absence of Alderman Holmes, the Chairman of the Committee, Alderman Bescoby expressed appreciation at the remarks made. He said he believed Alderman Holmes paid an almost daily visit to the gas-works during the strike; and the extreme ability of their Manager gave them assurance. Mr. Fenwick returned thanks for the reference to his services; saying that a great deal of the credit given was due to the Gas Committee, who, ever since he first entered their service many years ago, had supported him in whatever he did.

GAS COMPANIES' STOCK AND SHARE LIST.

The course of business on the Stock Exchange last week did not present any very remarkable feature. On most days it was decidedly quiet; and on Wednesday (being the 1st of May), the Exchange was closed. The chief markets, as a rule, underwent but little change. The gilt-edged division was kept up by the ease in money, Railways moved slightly, while awaiting developments in legislation and in labour questions affecting them, and the Foreign Market kept calm. But Americans were depressed by their own troubles. The opening day was not good; and the announcement of a failure helped to make things flatter, especially in speculative lines. Government issues were less strong, but Consols did not give way. Railways in general were weaker; and prices all round went down. Americans were flat; and the Foreign Market was irregular. The tone was better on Tuesday; but business was very quiet. Consols were again unchanged. Railways were flat at first, and improved later; the results at the close being irregular. Americans were uneven. Wednesday was an Exchange holiday. Thursday brought a sluggish reopening; and the tendency was only pretty fair. Government issues were stagnant; but Rails showed a rather better disposition, and closed a shade higher. Much animation prevailed in special shipping lines. Friday's business was on a restricted scale; and the tone for the most part was dullish. But Government issues were firmer, and Consols rose ⅛ for the account. Rails were languid, and, after swaying about, closed lower. Americans were quite heavy. The week concluded with another quiet Saturday, the chief markets making little movement. Consols closed unchanged at 78⅛ to 78⅜. In the Money Market, the rates both for short loans and for discount were easier. Business in the Gas Market showed some improvement upon the week before in point of volume, but even then it did not attain a fair average degree of activity. But the tendency was quite satisfactory; and a prominent feature was the smart advance scored by the premier Company. Apart from this, however, movements were small and scanty. In Gaslight and Coke issues, the ordinary was moderately dealt in, but soon showed its strength. After marking 103, it quickly reached 104, and 104½ was registered before the close—a rise of ¾. Not much was done in the secured issues; the maximum realizing 85¼, the preference 103, and the debenture from 78⅜ to 79⅛. South Metropolitan continued its upward movement, and changed hands at 118 special to 120—a rise of ½. The debenture was dealt in at 78⅞. Nothing was done in Commercials. Among the Suburban and Provincial group, Alliance and Dublin marked 78¼. Brentford new from 197 to 199½, British 45½, Brighton original 219, and Tottenham "B" 115½. On the local Exchange, Liverpool "A" made 220 (a rise of ½), and Chester 110½. In the Continental companies, Imperial marked from 191½ to 192½, European from 20 to 20¼, and Union from 84¼ to 85. Among the undertakings of the remoter world, Buenos Ayres debenture was done at 96½, Primitiva at 7½ to 7 $\frac{13}{16}$, and ditto preference at 5¼ to 5 $\frac{7}{16}$.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	77—80	..	6 5 0
374,000	Stk.	Jan. 12	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
250,000	5	Apl. 12	7½	Bombay, Ltd.	6—6½	..	5 15 5
50,000	10	Feb. 29	15	Bourne- } 10 p.c.	28½—29½	..	5 1 8
332,000	10	,,	7	mouth Gas } B 7 p.c.	16—16½	..	4 4 10
75,000	10	,,	6	and Water } Pref. 6 p.c.	14—14½	..	4 2 9
380,000	Stk.	,,	13	Brentford Consolidated	258—263	..	4 18 10
330,000	,,	,,	10	Do. New	195—200	..	5 0 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
206,250	,,	Dec. 14	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
219,055	Stk.	Feb. 29	11	Brighton & Hove Orig.	215—220	..	5 0 0
244,200	,,	,,	8	Do. A Ord. Stk.	156—159	..	5 0 8
490,000	20	Mar. 28	12½	British	45—46	..	5 8 8
120,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. Stk.	93—95	..	4 4 3
109,000	,,	Feb. 15	6	Bromley, A 5 p.c.	128—133	..	4 10 3
165,700	,,	,,	4½	Do. B 3½ p.c.	98—101	..	4 9 1
82,278	,,	,,	5½	Do. C 5 p.c.	117—120	..	4 11 8
55,000	,,	Dec. 29	3½	Do. 3½ p.c. Deb.	80—82	..	4 5 4
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	95—97	..	4 2 6
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4—5	..	—
100,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	76—80	..	5 12 6
157,150	Stk.	Feb. 15	5	Chester 5 p.c. Ord.	110—112	..	4 9 3
1,513,280	Stk.	Feb. 29	5/9/4	Commercial 4 p.c. Stk.	108—110	..	4 19 4
560,000	,,	,,	5½	Do. 3½ p.c. do.	103—105	..	5 1 6
475,000	,,	Dec. 14	3	Do. 3 p.c. Deb. Stk.	75—77	..	3 17 11
800,000	Stk.	,,	4	Continental Union, Ltd.	82—85	..	4 14 2
200,000	,,	,,	7	Do. 7 p.c. Pref.	136—138	..	5 1 5
492,270	Stk.	—	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk.	104—105	..	3 16 2
840,150	10	Jan. 31	10	European, Ltd.	19½—20½	..	4 17 7
16,160,600	Stk.	Feb. 15	4/14/8	Gas- } 4 p.c. Ord.	103½—104½	+¾	4 10 7
2,600,000	,,	,,	3½	light } 3½ p.c. max.	84—86	..	4 1 5
4,062,235	,,	,,	4	and } 4 p.c. Con. Pref.	102—104	..	3 16 11
4,631,705	,,	Dec. 14	3	Coke } 3 p.c. Con. Deb.	78—80	..	3 15 0
258,740	Stk.	Mar. 14	5	Hastings & St. L. 3½ p.c.	93—95	..	5 5 3
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	16½—17*	..	6 9 5
131,000	Stk.	Mar. 14	7½	Ilford A and C	152—154	..	4 17 5
65,780	,,	,,	6	Do. B	123—125	..	4 16 0
65,500	,,	Dec. 29	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
4,940,000	Stk.	Nov. 10	9	Imperial Continental	190—193	..	4 13 3
1,235,000	Stk.	Feb. 15	3½	Do. 3½ p.c. Deb. Red.	88—90	..	3 17 9
200,242	Stk.	Mar. 14	6	Lea Bridge Ord. 5 p.c.	125—129	..	4 13 0
561,000	Stk.	Feb. 29	10	Liverpool United A.	219½—221½	+½	4 10 3
718,100	,,	,,	7	Do. B.	159—161	..	4 6 11
306,083	,,	Dec. 29	4	Do. Deb. Stk.	100—102	..	3 18 5
75,000	5	Dec. 14	6	Malta & Mediterranean	4¾—5	..	6 0 0
560,000	100	Apl. 1	5	Met. of } 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 10	3½	Monte Video, Ltd.	12—12½	..	5 12 0
1,775,892	Stk.	Feb. 15	4½	Newc'tle&G'tesh'd Con.	99—101	..	4 6 8
529,705	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	86—88	..	3 19 7
55,940	10	Feb. 29	7/7/0	North Middlesex 7 p.c.	14—15	..	4 18 0
300,000	Stk.	Dec. 14	8	Oriental, Ltd.	137—139	..	5 15 1
60,000	5	Mar. 14	8	Ottoman, Ltd.	7—7½	..	5 6 8
31,800	53	Feb. 29	13	Portsea Island A	137—140	..	4 18 4
60,000	50	,,	13	Do. B	130—133	..	4 17 9
100,000	50	,,	13	Do. C	127—130	..	4 12 4
398,490	5	Oct. 12	8	Primitiva Ord.	7½—7¾	—⅛	5 3 3
796,980	5	Dec. 29	5	Do. 5 p.c. Pref.	5¼—5½	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
312,650	Stk.	Dec. 29	4	River Plate 4 p.c. Deb.	95—97	..	4 2 6
250,000	5	Apl. 12	12	San Paulo, Ltd.	11¼—11¾	..	5 2 2
115,000	10	,,	6	Do. 6 p.c. Pref.	11½—12	..	5 0 0
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	50—51	..	4 18 0
135,000	Stk.	Mar. 14	10	Sheffield A	235—237	..	4 4 5
209,984	,,	,,	10	Do. B	234—236	..	4 4 9
523,500	,,	,,	10	Do. C	234—235	..	4 5 1
90,000	10	Sept. 28	6	South African	8—9	..	5 13 4
6,429,895	Stk.	Feb. 15	5/9/4	South Met., 4 p.c. Ord.	118—120	+½	4 11 0
1,895,445	,,	Jan. 12	3	Do. 3 p.c. Deb.	78—80	..	3 15 0
209,820	Stk.	Feb. 29	8½	South Shields Con. Stk.	156—158	..	5 7 7
605,000	Stk.	Feb. 15	5/16/8	S'th Suburb'n Ord. 5 p.c.	122—124	..	4 14 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	117—120	..	4 3 4
117,058	,,	Jan. 12	5	Do. 5 p.c. Deb. Stk.	119—121	..	4 2 8
502,310	Stk.	Nov. 10	5	Southampton Ord.	107—109	..	4 11 9
120,000	Stk.	Feb. 15	7½	Tottenham } A 5 p.c.	144—147	..	4 17 0
483,940	,,	,,	5⅝	and } B 3½ p.c.	114—116	..	4 17 0
149,470	,,	Dec. 29	4	Edmonton } 4 p.c. Deb.	96—98	..	4 1 8
182,380	10	,,	5	Tuscan, Ltd.	8⅜—8¾	..	5 12 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Feb. 29	5	Tynemouth, 5 p.c. max.	112—114	..	4 7 9
255,636	Stk.	,,	6⅝	Wands- } B 3½ p.c.	141—144	..	4 15 6
85,766	,,	Dec. 29	3	worth } 3 p.c. Deb. Stk.	71½—73½	..	4 1 8

Prices marked * are "Ex. div."

Altheat Company, Limited, "gas manufacturers, &c.," was registered as a Company on the 30th ult., with a capital of £5000 in £1 shares.

A company, called Machite Limited, was recently registered as gas-mantle makers, with a capital of £900 in £1 shares, half of which are preference.

The Manchester City Council at last Wednesday's meeting confirmed the resolution of the Gas Committee that application be made for sanction to borrow £200,000 for gas-works purposes.

The Uxbridge Gas Company are considering an application from the people of Horton for a supply of gas; and it is probable that before very long the mains will be extended to the village.

Among the registrations of Scottish joint-stock companies last week was that of George Terry and Co., Limited, of West Campbell Street, Glasgow, to carry on the business of incandescent gas lighting, power, and heating engineers. The Company is a private one; and the capital is £3000, in £1 shares.

The Regenerative Stove Company, Limited, has been registered with a capital of £25,000, in 22,500 preference shares of £1 each, and 20,000 ordinary shares of 2s. 6d. each, to acquire the business and undertaking of the Harris atmospheric burner, and to adopt an agreement with Commercial Ventures, Limited.

In the "Register of Patents" in the "JOURNAL" for the 16th ult., an illustrated description was given of the sulphate of ammonia plant devised by Mr. J. Stephenson, of Hunslet, near Leeds. We learn that the sole right of manufacturing this plant has been acquired by Messrs. Firth Blakeley, Sons, and Co., Limited, of Dewsbury.

We have received from the Lennox Foundry Company, Limited, of New Cross, S.E., a catalogue of their "Tantiron" specialities. This is claimed to be the first real acid-resisting alloy ever put on the market; and it is stated that it does not rust or oxidize, nor is the metal attacked by ordinary corrosive to any significant extent. The illustrations in the catalogue show that there is practically no limit to the form which "Tantiron" can be made to take.

The Water Committee of the Manchester City Council propose spending £160,000 on new works at Longdendale.

The new catalogue which has been issued by Messrs. Thomas Glover and Co., Limited, of which we have received a copy, embodies particulars of all their principal manufactures—such as gas-meters of all descriptions, test gasholders, pressure-gauges, street lanterns, &c. The catalogue opens with views of the Company's extensive works at Edmonton, Birmingham, and Falkirk, and of the show-rooms in London and Glasgow. These, and the illustrations of the various kinds of meters, &c., are excellently printed; and the whole catalogue commends itself as a high-class production worthy of a place upon every gas manager's table.

Among the contracts which Messrs. Firth Blakeley, Sons, and Co., Limited, of Dewsbury, have lately executed or have in hand are the following: A large oil-storage tank, 47 ft. 6 in. long, 18 feet wide, and 25 feet deep, divided into ten separate chambers for storing different oils, with steam coils. It weighs upwards of 70 tons, and has a capacity of about 950 tons; and it was for a large firm of oil and seed importers in Liverpool. Coal shoots, hoppers, &c., with improved measuring chambers, for the Sheffield Corporation electricity supply station; and a very similar installation for the Hornsey Corporation. Carburetted water-gas plant for the Salisbury Gas Company, to be carried out under the supervision of Mr. Norton H. Humphrys, the Company's Engineer and Manager. Extensions at the Burton Latimer Gas-Works, comprising a new retort-bench, foul main, three steel annular condensers, Livesey washer and tower-scrubber, 12-feet square purifiers, alterations to existing purifier connections, and adding an outer lift to the 51 feet diameter gasholder—all to be carried out to the specification and particulars prepared by the Manager, Mr. F. Orchard. The firm are making, in their second-hand branch at Church Fenton, a speciality of dismantling old gas-works; and they have recently completed the taking down of plant at Merthyr Tydfil, consisting of 92 retorts and other appliances, including a three-lift holder; and also the old works at Caterham, comprising a heavy double-lift and a 50-feet single-lift gasholder.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ASSISTANT-MANAGER. No. 5561.
DRAUGHTSMAN. No. 5553.
DRAUGHTSMAN. No. 5562.
DRAUGHTSMAN. No. 5560.
DRAUGHTSMAN. Robert Dempster and Sons, Elland.
FOREMAN (METER-WORKS). No. 5556.
REPRESENTATIVE (GAS LIGHTING). No. 5559.
REPRESENTATIVE (METERS). No. 5563.
AGENTS (PAINTS, &c.). Box 82, Dalross, Limited, 17, Bouverie Street, London, E.C.
WATER-GAS PLANT ERECTOR. Firth Blakeley, Sons, and Co., Thornhill.

Appointments, &c., Wanted.

SULPHATE PLANT MAKER AND REPAIRER. Leadburner. 15, Martin Street, Stratford.

Books (Second-Hand) for Disposal.

ASSOCIATION REPORTS and GAS INSTITUTE TRANSACTIONS. Robinson, Newcastle-on-Tyne.

Plant, &c. (Second-Hand), for Sale.

PURIFIERS AND WASHERS. Abertillery Urban District Council.

Plant, &c. (Second-Hand), Wanted.

WASHER-SCRUBBER. Stanley Gas Company.

Stocks and Shares for Sale.

ASCOT GAS AND ELECTRICITY COMPANY. London Mart. May 16.
BOGNOR GAS COMPANY. London Mart. May 21.

Stocks and Shares for Sale (*continued*).

CANNOCK, HEDNESFORD, AND DISTRICT GAS COMPANY. Public Rooms, Cannock, May 6.
CITY OF ELY GAS COMPANY. London Mart. May 16.
HARROW AND STANMORE GAS COMPANY. London Mart. May 21.
HERNE BAY GAS COMPANY. London Mart. May 16.
HOUGHTON-LE-SPRING GAS COMPANY. London Mart. May 16.
ILFORD GAS COMPANY. London Mart. May 21.
LOWESTOFT WATER AND GAS COMPANY. London Mart. May 21.
MID KENT WATER COMPANY. London Mart. May 21.
TENDRING HUNDRED WATER COMPANY. London Mart. May 21.
YORKTOWN AND BLACKWATER GAS COMPANY. London Mart. May 16.

Meeting.

SOUTH BARRACAS (BUENOS AYRES) GAS AND COKE COMPANY. 1, East India Avenue, E.C. May 16. 12.30 o'clock.

TENDERS FOR

Benzol.

LEIGH (LANCS.) CORPORATION. Tenders by May 21.

Coal and Cannel.

LLANDUDNO URBAN DISTRICT COUNCIL. Tenders by May 25.

Gas-Fires.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by May 13.

Gasholder, Tank, &c., and Alterations.

WINSFORD GAS DEPARTMENT. Tenders by May 14.

General Stores (Lime, Lead Piping, Vitriol, Retort Castings, &c.)

LEEDS GAS DEPARTMENT. Tenders by May 18.
LEIGH (LANCS.) CORPORATION. Tenders by May 21.
MACCLESFIELD GAS DEPARTMENT. Tenders by May 13.

Oil for Gas Manufacture.

LEEDS GAS DEPARTMENT. Tenders by May 18.
LEIGH (LANCS.) CORPORATION. Tenders by May 21.

Pipes (Wrought and Cast), &c.

LEEDS GAS DEPARTMENT. Tenders by May 18.
LEIGH CORPORATION. Tenders by May 21.
MACCLESFIELD GAS DEPARTMENT. Tenders by May 13.

Tar and Liquor.

MACCLESFIELD GAS DEPARTMENT. Tenders by May 13.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: "SATURATORS BOLTON." Telephone 0848.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.

GENERAL MANAGERS—
London and South of England:
W. T. P. CUNNINGHAM,
13, Arcadian Gardens, Wood Green, LONDON, N.
North of England, Midlands, and Wales:
J. BROWN & CO., LTD., Savile Town, DEWSBURY.
Scotland and Ireland:
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

OXIDE OF IRON.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
"KLEENOFF," THE COOKER CLEANER.
BALE & CHURCH, LTD.,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 1588 AVENUE (3 lines).

FOR Instructions on Polishing and Cleaning Gas-Cookers and Gas-Fittings, read Canning Handbook on Polishing, Electro-Plating, and Lacquering. Fully illustrated. Price 2s. 3d., post free; abroad, 2s. 6d.
W. CANNING AND CO., BIRMINGHAM, and 18 to 20, St. John's Square, Clerkenwell, LONDON, E.C.